665.505
1039
v.28 no.15

Pipe Line Number 15 Cents

The OIL and GAS JOURNAL

PRODUCING REFINING ENGINEERING MARKETING

Published Every Thursday TULSA, OKLAHOMA, AUGUST 29, 1929 $6.00 a Year

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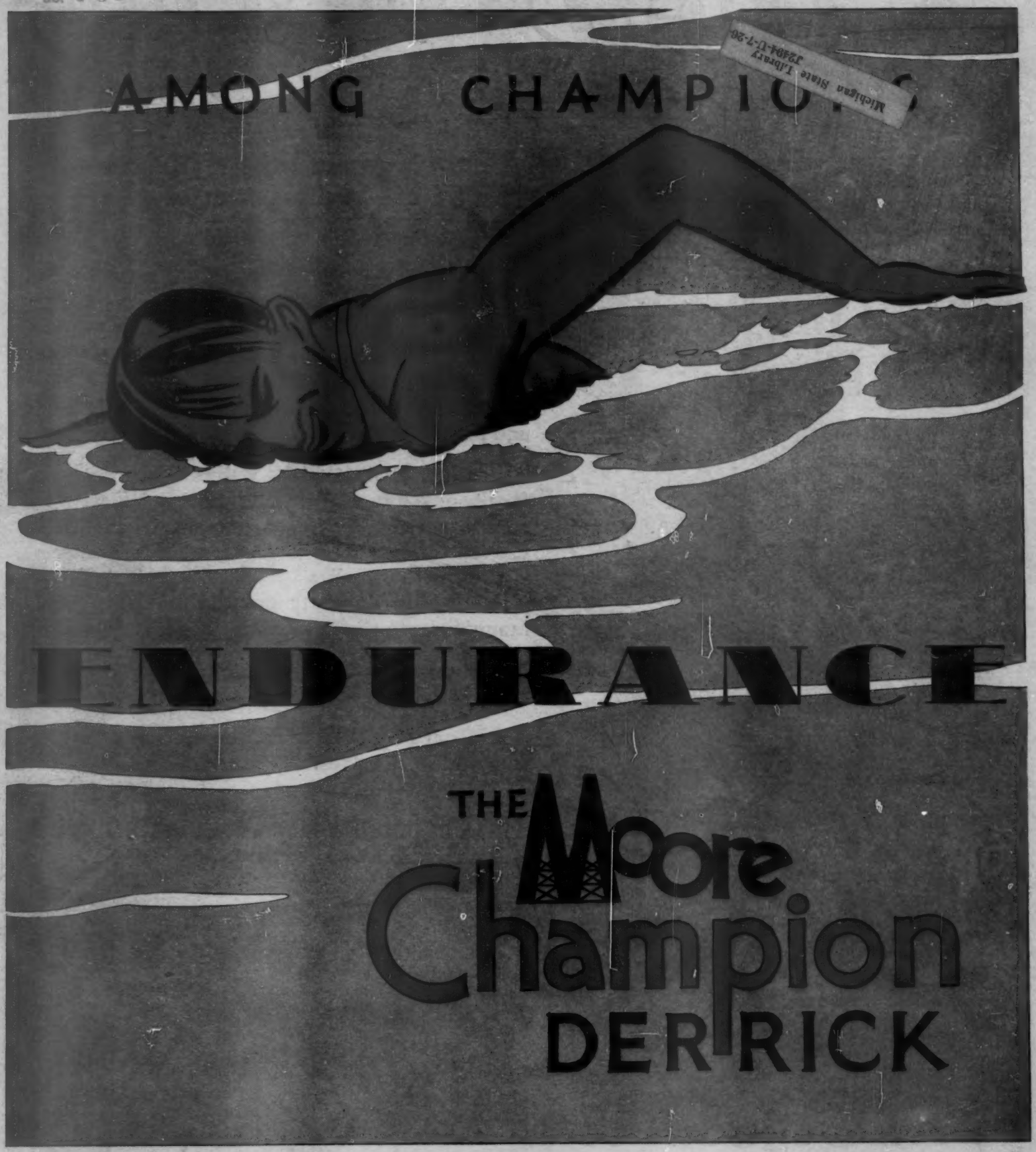


Advertisers' Index on Page 29 Table of Contents on Page 30

Put good valves on the pipe line

Safeguard your profits in oil transportation . .

Use pipe line valves with a clean record for unfailing performance during the longest periods of time.

The feeling of assurance with which an engineer puts a CHAPMAN in the line, has a solid basis in fact; oil men know that CHAPMAN Valves are built for the job, thoroughly tested in the shop, and proved in the field. Depend upon them.

There are CHAPMAN Valves for production, for the pipe line, and for the refinery. Where pressures or temperatures are high, CHAPMAN Chrome Nickel Steel (stronger than forged steel) is used in the bodies. If wear is a high factor, CHAPMAN Valves trimmed with *Nitralloy* add many times to the normal valve life.

You can get these valves from our distributor or agent in your territory.

Ask about NITRALLOY, the new mounting for iron and steel valves.

The Chapman Valve Manufacturing Co.
Indian Orchard, Mass.

Branch Offices

Houston	Philadelphia	Los Angeles
Atlanta	Chicago	New York
Detroit	San Francisco	Tulsa
Pittsburgh	Syracuse	Boston

Distributors
E. L. Wilson Hardware Co., Beaumont and Houston
Wagner Supply Co., Fort Worth

Chapman Valves

NO INSERTED PARTS

A new union that has "class," as its name suggests . . . the "Kewanee 400" is an all-forged union designed to keep step with the upward march of pressures and temperatures.

The famous three-piece principle of the Kewanee Union, and the forged bronze to forged steel non-corroding joint are retained. The old malleable iron ring has been replaced by a forged steel ring so that the thread connection, also, is now forged bronze to forged steel which gives the "Kewanee 400" increased strength and resistance to high pressures.

Now available in sizes ⅛" to 2" inclusive. These sizes are recommended for 400 lbs. Working Steam Pressure at 500 degrees F.

At the Sixth International Petroleum Exposition and Congress, Tulsa, Oklahoma
In booths 104, 105, 106 and 107, Oklahoma Building, Walworth is showing a complete line of valves, fittings and tools, and Walworth C.N.I. Pipe.

EVERY ONE IS AIR TESTED UNDER WATER

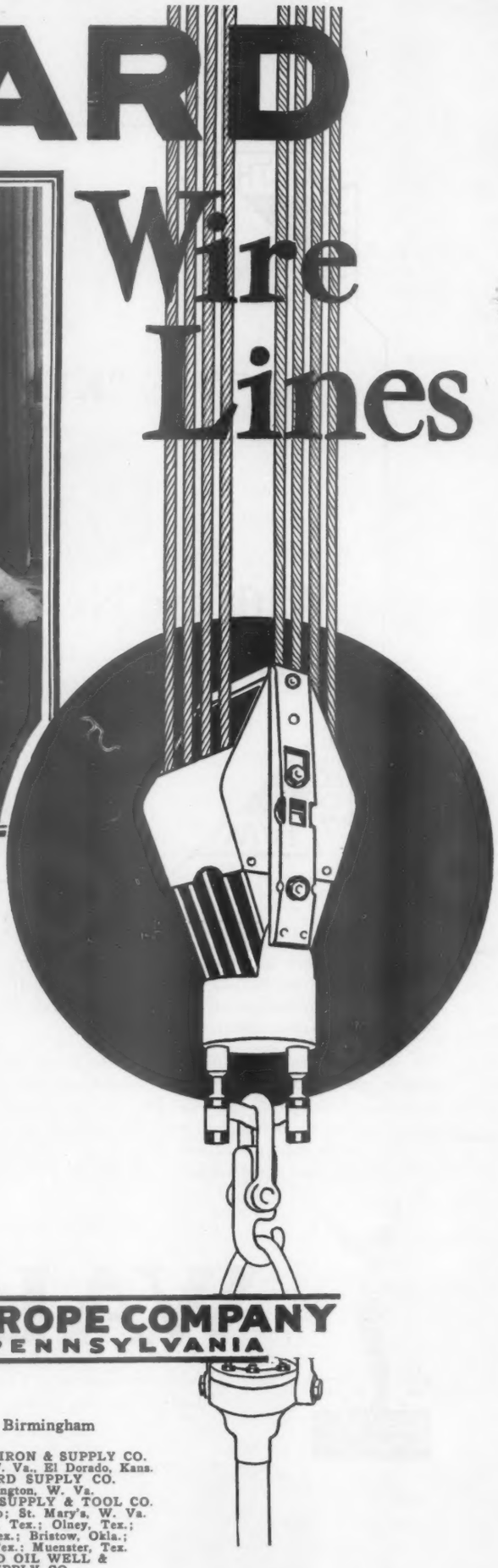
WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa., and Attalla, Ala.

Distributors in Principal Cities of the World
Walworth Company Limited, 620 Cathcart St., Montreal, P. Q.
Walworth International Co., 11 Broadway, New York, Foreign Representative

The Oil and Gas Journal, issued weekly by The Petroleum Publishing Company, 114-116 West Second Street, Tulsa, Oklahoma. Subscription price $6.00 a year; 15 cents a copy
Entered as second-class mail matter December 15, 1911, at the post office at Tulsa, Okla., under the Act of March 3, 1879.

HAZARD Wire Lines



Thrive on the bends and increasing loads of rotary drilling

EXTRA strength—and the ability to withstand constant bends without injury, are inherent qualities of Hazard Drilling lines.

Built especially for the increasing loads of rotary drilling, Hazard lines can be depended upon to return the utmost in rotary efficiency.

Let us send you complete information on the advantages of Hazard Wire lines for rotary drilling, and all other oil field requirements.

HAZARD WIRE ROPE COMPANY
WILKES-BARRE PENNSYLVANIA

1625 South Troost Ave., TULSA, OKLA.

New York Pittsburgh Chicago Denver Los Angeles San Francisco Birmingham

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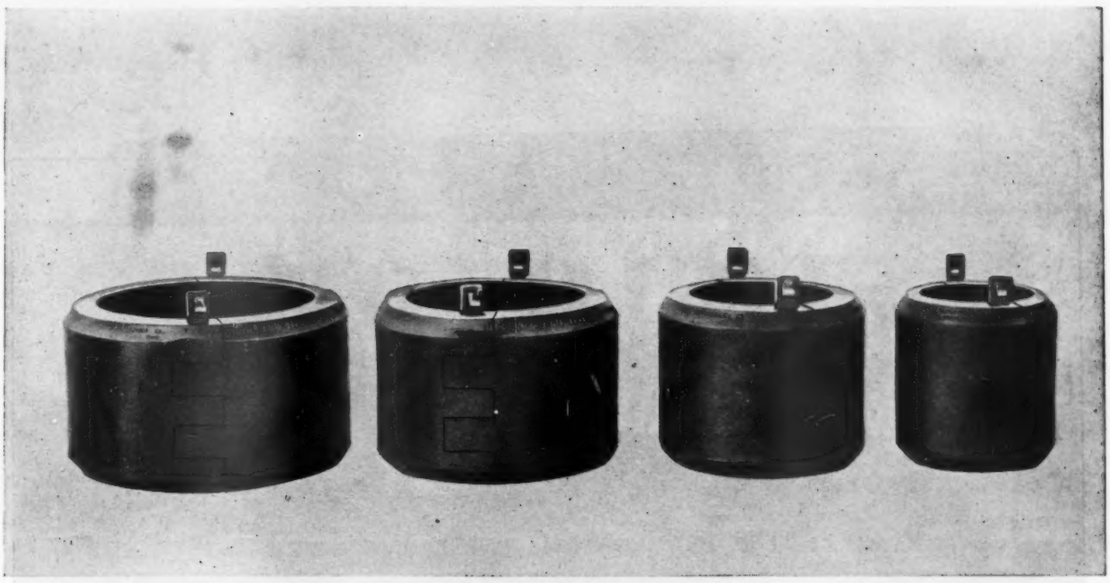
UNITED OIL WELL & SUPPLY CO.
Los Angeles



No other casing guard has these important features

THE Goodrich Grip-Tite Casing Guard has a metal-locking construction, *completely embedded in rubber,* and so unique that (1) the guard can be applied to the pipe in *a few seconds;* (2) it cannot possibly work loose or change its position.

Yet that is but part of the story. It is an equally important feature that the rubber cannot come loose from the metal. Engineers are familiar with the Goodrich Vulcalock Process — by which rubber is "locked" to metal. The union achieved by this process is so strong that in adhesion tests the rubber itself will often tear before it separates from the metal. The development of this Goodrich process is almost a romance; it is a vital feature of the Grip-Tite Casing Guard.

It is also an important feature that the metal is completely *embedded* in the rubber. There can be no metal-to-metal contact.

See how this metal locking construction eliminates delay in putting on and taking off

Goodrich Grip-Tite Casing Guards need no expensive and clumsy special appliances to apply. A hammer is all that's required. Any workman can put them on in ten seconds. And it's just as simple to remove them. Unlock the pin—that's all. They eliminate wasteful destruction—unavoidable when old-type guards are used.

Twenty-five to thirty-three per cent saving in power is not unusual when these guards are used. They eliminate friction between the casing and drill pipe, increasing the speed of deep-well drilling.

If you don't already know all about them—if you're not already using them —let us give you additional information. The B. F. Goodrich Rubber Co., Est. 1870, Akron, Ohio.

•

Oil Field Branches

Pacific Goodrich Rubber Co.:
1386 East 7th St., Los Angeles, Cal.
650 Second St., San Francisco, Cal.
2625 Walnut Street, Denver, Colo.

The B. F. Goodrich Rubber Co.:
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and other principal cities

Goodrich

VEZ

PATENTS PENDING

▲▲▲▲ for Treating Crude Oil Emulsions

Ultimately you will use VEZ, a rapid, efficient and economical method of recovering oil from emulsions. A majority of the large producers are using it. A formula for every type of cut oil.

The Vez Company
Manufacturing Chemists
2221-3 Laws Street
Dallas, Texas

"*Ask the Man Who Uses It*"

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NO RUST

Red-Lead keeps it out!

ON STEEL WORK of every type, pure red-lead paint has proved its unusual protective value again and again. Standard for years. *Still* the accepted standard of protective paint for metal *today.*

The reason? Pure red-lead paint possesses properties that make it adhere to metal in an unbroken film for years. It keeps out moisture and other rust-forming agents. Three coats of pure red-lead give continuous protection, unexcelled in length of life.

For painting iron and steel, there is no better red-lead obtainable than Dutch Boy red-lead. It comes in two forms—paste and liquid. The liquid (ready for the brush) is supplied in six different colors. The paste comes in natural orange-red and can be shaded to dark colors.

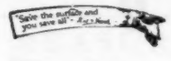
For information on special painting problems, write our Department of Technical Paint Service, in care of our nearest branch. There is no obligation.

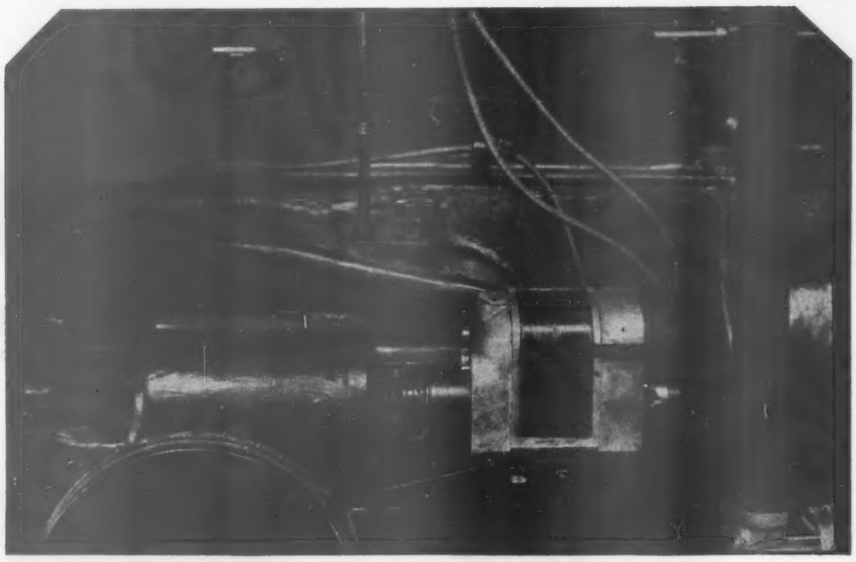
DUTCH BOY SOLDER

Another Dutch Boy product is solder. There is a Dutch Boy solder for every purpose, each bar or ingot carrying a number to indicate its exact composition. Dutch Boy 111, for example, is a solder containing 50% tin and 50% lead.

NATIONAL LEAD COMPANY

New York, 111 Broadway · Buffalo, 116 Oak Street · Chicago, 900 West 18th Street · Cincinnati, 659 Freeman Avenue · Cleveland, 820 West Superior Avenue · St. Louis, 722 Chestnut Street · San Francisco, 235 Montgomery Street · Boston, National-Boston Lead Co., 800 Albany Street · Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Avenue Philadelphia, John T. Lewis & Bros. Co., Widener Bldg.

DUTCH BOY  RED-LEAD



How the large important oil companies

Keep Pumping Engines *Pumping!*

A PECULIAR condition exists in the pumping plants at the oil fields. Nowhere else perhaps is equipment put to such tests of endurance and reliability as the 24 hour, day-in and day-out service in a pumping plant. Nowhere else do shut-downs involve the heavy losses suggested by the phrase "a barrel lost is lost forever," a phrase familiar to every oil man.

No wonder then that the Super-Energy Magneto has been so widely adopted in the oil field. For this magneto not only gives the extra power that its name promises. Every detail of design eliminates a source of ignition trouble. Thus it is absolutely dustproof and waterproof. Its ball bearings never require lubrication. Its rugged one-piece aluminum frame prevents ball bearings from becoming loose. Which suggests only a few of the developments which make the Super-Energy Magneto the masterpiece of Robert Bosch, who founded the magneto industry over 40 years ago.

For the giant gas engine of 1000 B.H.P.... for the smaller higher speed stationary engines of 15 B.H.P.... for other smaller engines down to the smallest single cylinder engine, there a suitable type of Super-Energy Magneto, just as there is for trucks, tractors, stationary and marine engines of all descriptions. Write for a copy of "Ignition Briefly Described," containing ignition information which you will find both interesting and useful.

The upper photo shows a close-up of a Robert Bosch Super-Energy Magneto on an engine in a large oil plant. This type of Super-Energy Magneto is used on all of the engines in this plant, as shown in the lower photograph.

Only Robert Bosch Super-Energy Magnetos are Original-Bosch Magnetos. For your protection look for the full name "Robert Bosch" and trademark shown at right . .

ROBERT BOSCH MAGNETO CO., Inc.
3601E Queens Blvd., Long Island City, N. Y.

The Original Bosch
ROBERT BOSCH PRODUCTS

Super-Energy Magneto

MARTIN-LOOMIS AUTOMATIC RECORDING WEIGHT INDICATOR

Here's How

The **Martin-Loomis Weight Indicator**

Aids Operators In Drilling

BETTER HOLES

Here's the record of Superintendent E. C. Brown: At TAFT, CALIFORNIA, Mt. Diablo No. 1. Italo Petroleum Corporation drilled with 3 points weight as recorded by the Martin-Loomis Weight Indicator. Drilled 3600′ of 15″ hole 30 days ahead of established drilling time.

At LAWNDALE, CALIFORNIA, Lincoln No. 1. Allied Petroleum Corporation drilled with 2 points of weight as recorded by the Martin-Loomis Weight Indicator. Drilled 5703′ of 12¼″ hole in 50 drilling days. No fishing jobs. 69 cores with 96% recovery. Hole very straight.

At LONG BEACH, CALIFORNIA, Garrison No. 1. Allied Petroleum Corporation drilled with 1 point weight as recorded by the Martin-Loomis Weight Indicator. Now 5410′ deep. 12¼″ hole to 5405′. Well surveyed at 5000′ and found remarkably straight.

THE MARTIN-LOOMIS INDICATOR GIVES AN ACCURATE RECORD AND COMPLETE CONTROL OF ALL DRILLING OPERATIONS.

MARTIN-LOOMIS CORPORATION

Mid-Continent Distributors
Reed Roller Bit Company
Houston, Texas

2827 Cherry Ave.
LONG BEACH
CALIFORNIA

Foreign Distributors
Oil Well Supply Company
Pittsburgh, Pa.

WEIGHT, RECORDING, MEASUREMENT AND CONTROL

Make 24 Hour Drilling Surer, Steadier, More Profitable with "Flud-Lite"

24 hour drilling operations are put on a new, dependable basis by this new Novo Flud-Lite Lighting Unit.

It is built especially for oil field work with a standard Westinghouse Generator powered by a Novo Roller Bearing Engine.

All night long this unit assures steady, unflickering light for your location.

With engine speed automatically controlled to within 5% and voltage held constant within 3 volts the flickering and burning out of bulbs so common to more ordinary units are eliminated.

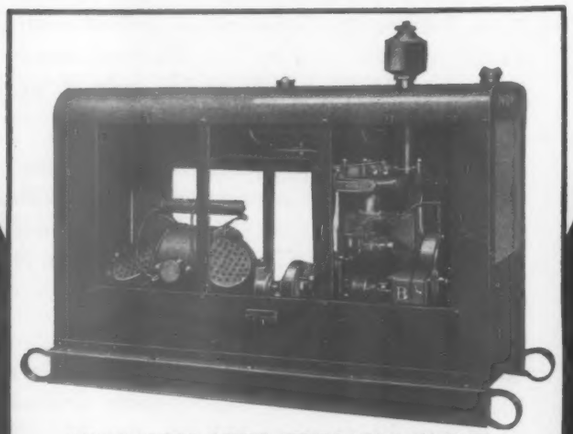
And there need be no hold up in work while bulbs are replaced.

In addition this unit provides the quarter turn (impulse magneto starter) starting—the vibrationless operation that only light, balanced reciprocating parts and 180° opposed double throw crank shaft can provide — the low fuel consumption of frictionless bearings—and surplus power to handle light auxiliary machinery such as grinders and compressors.

This Novo Flud-Lite Unit comes completely enclosed in a steel lock-up house — compactly arranged for ready portability — in sizes of from 1¾ K.W. to 5 K.W.

Send the coupon today for complete information on this dependable low-cost insurer of more profitable night work.

NOVO ENGINE COMPANY
240 Porter Street — Lansing, Mich.
CLARENCE E. BEMENT, Vice-Pres. & Gen. Mgr.



NOVO "FLUD-LITE" GENERATOR 2½ K.W.
(Door Removed)

NOVO Flud-Lite Lighting Units

Sold and Serviced by National Supply Company

Name _____

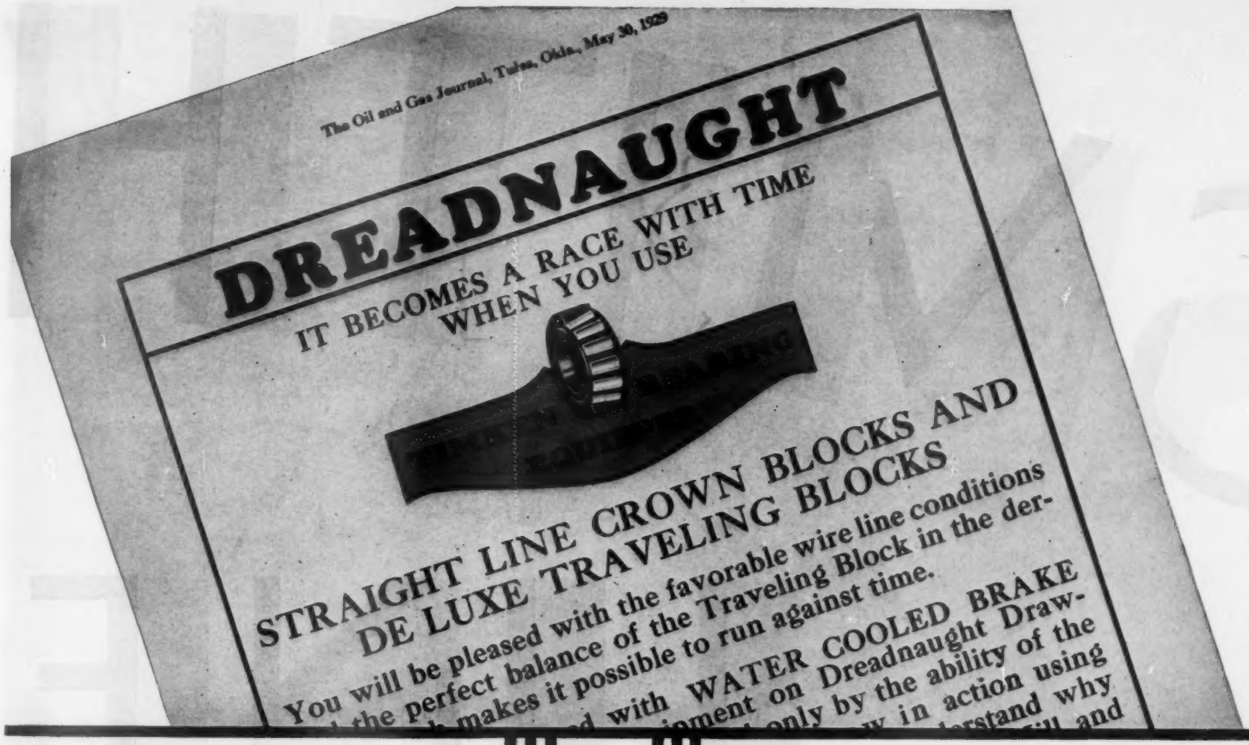
Address _____

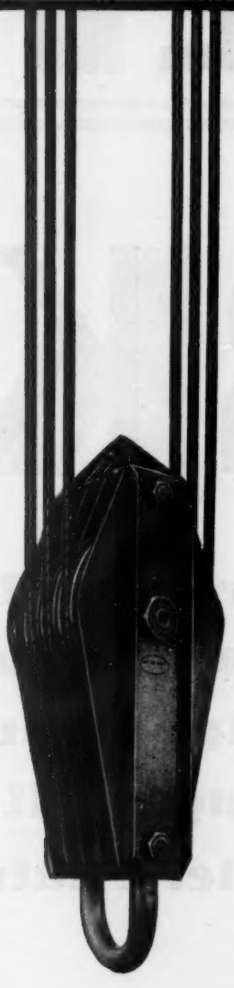
City _____ *State* _____

Company _____

Send Today

Please send me prices and complete catalog literature on Novo Flud-Lite Lighting Units for the oil fields.


The Oil and Gas Journal, Tulsa, Okla., May 30, 1929
DREADNAUGHT
IT BECOMES A RACE WITH TIME WHEN YOU USE
STRAIGHT LINE CROWN BLOCKS AND DE LUXE TRAVELING BLOCKS
You will be pleased with the favorable wire line conditions
the perfect balance of the Traveling Block in the der-
makes it possible to run against time.
with WATER COOLED BRAKE
ment on Dreadnaught Draw-
only by the ability of the
in action using
why



Beaumont Recognizes Timken Acceptance

Beaumont Iron Works Company, Beaumont, Texas, use Timken Bearings in their crown and traveling blocks for greater endurance, economy and operating efficiency.

They feature "Timken Bearing Equipped" in their advertising because they know that it is accepted as proof of superior merit in all types of oil field equipment.

For Timken is *the one bearing that does all things well* . . . whether the loads are all *radial* . . . all *thrust* . . . *or a combination of both* . . . through the exclusive combination of Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken steel.

THE TIMKEN ROLLER BEARING CO.
C A N T O N , O H I O

TIMKEN
Tapered
ROLLER BEARINGS

SMITH LINE MARKS A

in the history of Underground Transportation. ¶Because of the speed and accuracy with which SMITHWelded Line Pipe is produced, titanic new pipe lines are being built at a rate never before thought possible. ¶Natural gas will be

A. O. SMITH

Oil and Gas Field Products Division

District

New York ... Tulsa ...

WELDED PIPE

AN EPOCH

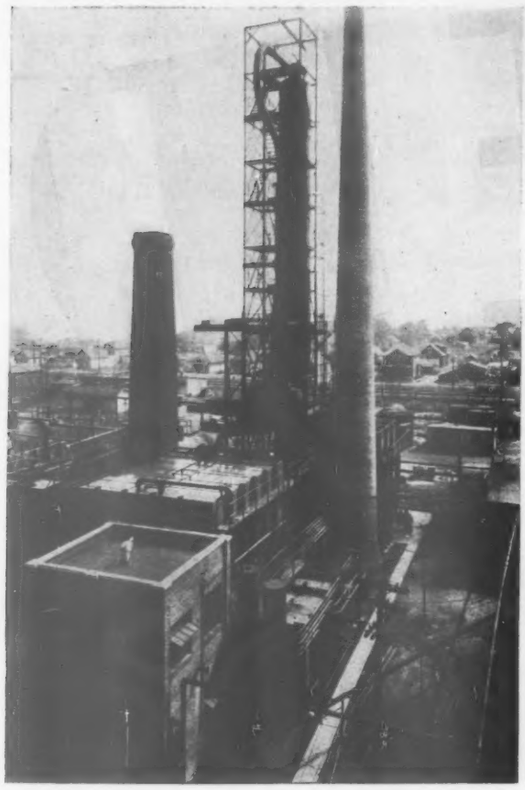
brought to additional tens of millions of people, faster and cheaper than ever before. ¶ At last the development of Underground Transportation has caught the tempo of the oil and gas industries.

CORPORATION

***General Offices*: MILWAUKEE, WISCONSIN**

Offices

Houston ... Los Angeles



Seven Streams to Specification From This Foster Wheeler Distilling Unit

The distilling unit shown above was completely designed and erected by the Foster Wheeler Corporation. It has a rated capacity of 1500 barrels per day of 34-36 A.P.I. gravity crude running to a heavy flux bottom and vaporizing approximately 93 per cent of the thruput when operating at rated capacity.

The distilling unit is designed for the continuous recovery to specification of gasoline as the overhead vapor; kerosene, gas oil, wax distillate, two cuts of overhead lubricating stock, as side streams; running to heavy gravity flux bottoms.

The flexibility of the Foster Wheeler single tower unit permits satisfying varying market conditions without sacrifice of thruput. The tower is so designed that within certain ranges it will handle the same total quantity of overhead distillate, regardless of the particular split-up of the desired cuts. Various crudes may also be handled by this same equipment.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.
Branches in Principal Oil Centers

Foreign Associates:
Foster Wheeler Limited; London, England.
Societe Anonyme Foster Wheeler; Paris, France.
Foster Wheeler Limited; Toronto-Montreal-Vancouver, Canada.

FOSTER WHEELER

Supreme in its class

For Steam, Water, Air, Oil, Gas and Gasoline

LUNKENHEIMER "KING-CLIP" GATE VALVES

(PATENT PENDING)

(TRADE MARK REG. IN U. S. AND FOREIGN COUNTRIES)

Iron Body Bronze Mounted
All Iron

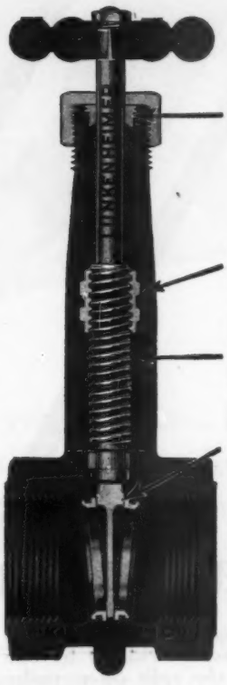
Inside Screw
Outside Screw and Yoke
Quick Operating

Screw Ends
¼ to 2 in. inclusive
150 lb. Working Steam Pressure
225 lb. Gas or Liquid Pressure

Also made with Screw Ends 2½ to 4 in. inclusive and with Flange Ends 1½ to 4 in. inclusive for 125 lb. W. S. P. and 175 lb. G. L. P.

Flange End Valves—face to face dimensions conform to standard trade practice.

All patterns of Lunkenheimer "King-clip" Gate Valves are illustrated and described in Booklet No. 504. A copy will be sent upon request. Lunkenheimer Distributors are prepared to furnish "King-clip" Gate Valves.



Gland in stuffing box sizes 1 inch and larger

Iron bonnet with bronze threaded bushing providing non-corrosive contact with stem.

Bronze stem. Rugged wear-resisting threads. Full contact with bronze bushing in bonnet with valve open or closed. Repacking shoulder—valve may be repacked under pressure when wide open.

Bronze double-faced disc, sharply tapered, will handle heavily impregnated fluids. Horseshoe band strengthens connection with stem.

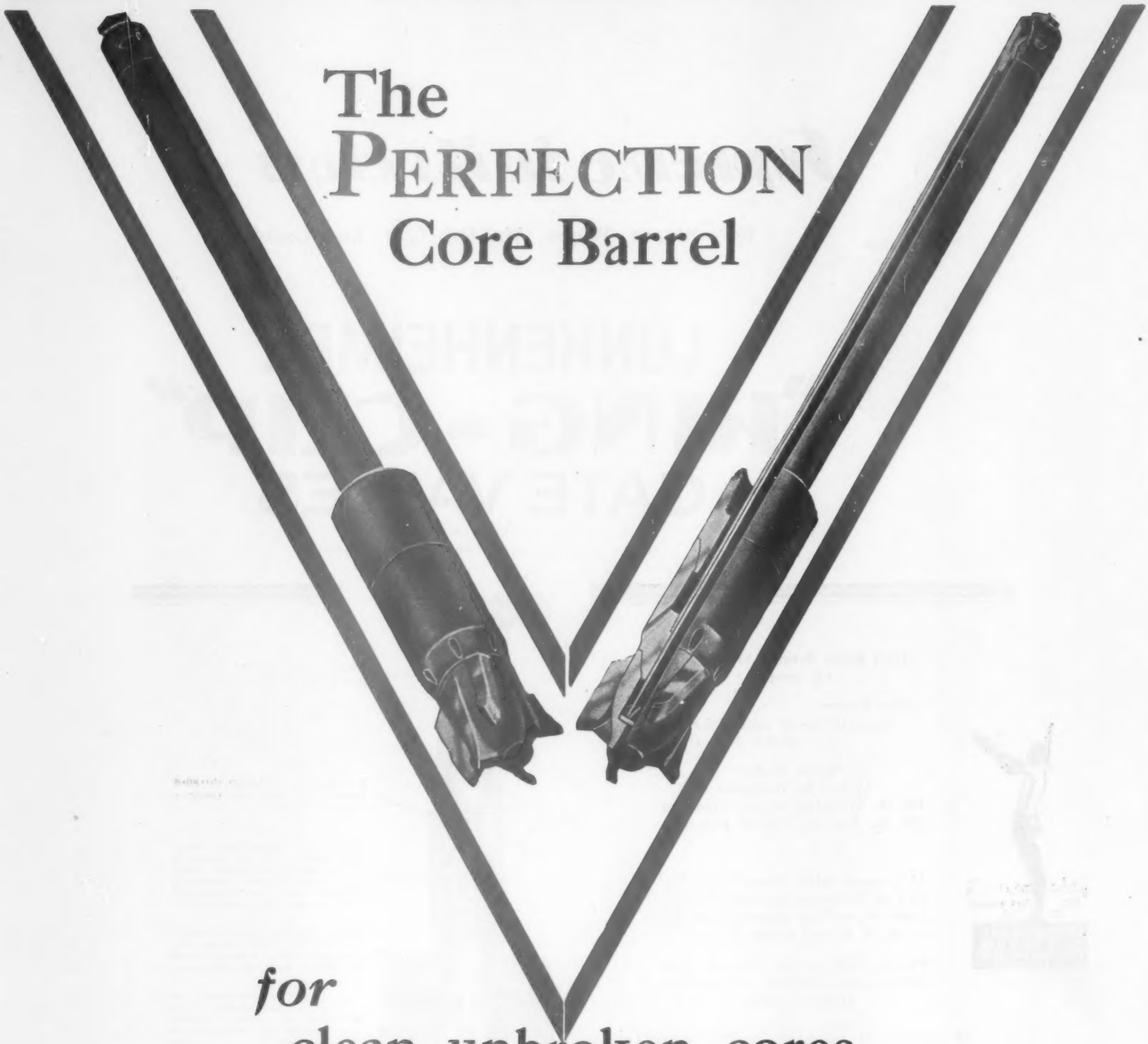
Iron Body with bronze seat rings rigidly secured. Extra long pipe threads accommodate both American (Brigg's) Standard and A. P. I. line pipe.

Fig. 1640
Iron Body Bronze Mounted

THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO BOSTON PHILADELPHIA
PITTSBURGH SAN FRANCISCO LONDON
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

LUNKENHEIMER VALVES

6-53-91



The PERFECTION Core Barrel

for clean unbroken cores

The Perfection Core Barrel is kept clean until it reaches bottom (regardless of bridges) by one of its exclusive patented features. Another, *the split liner*, makes it easy to remove the core . . . unbroken.

Our cutter head exchange plane (through any distributor) and the simple construction of the barrel from high grade chrome nickel steel, assure service you can depend on. Cutter heads for both hard and soft formations. Hard formation Cutter Heads are faced with a substance of diamond-like hardness.

Write for list of users and our catalog giving complete details and prices.

Branch Warehouse:
Houston
2000 Harrington St.
Telephone Capitol 3021

Branch Warehouse:
Oklahoma City, Okla.
Red Ball, Inc.
2-4 East California St.
Phone W-3680

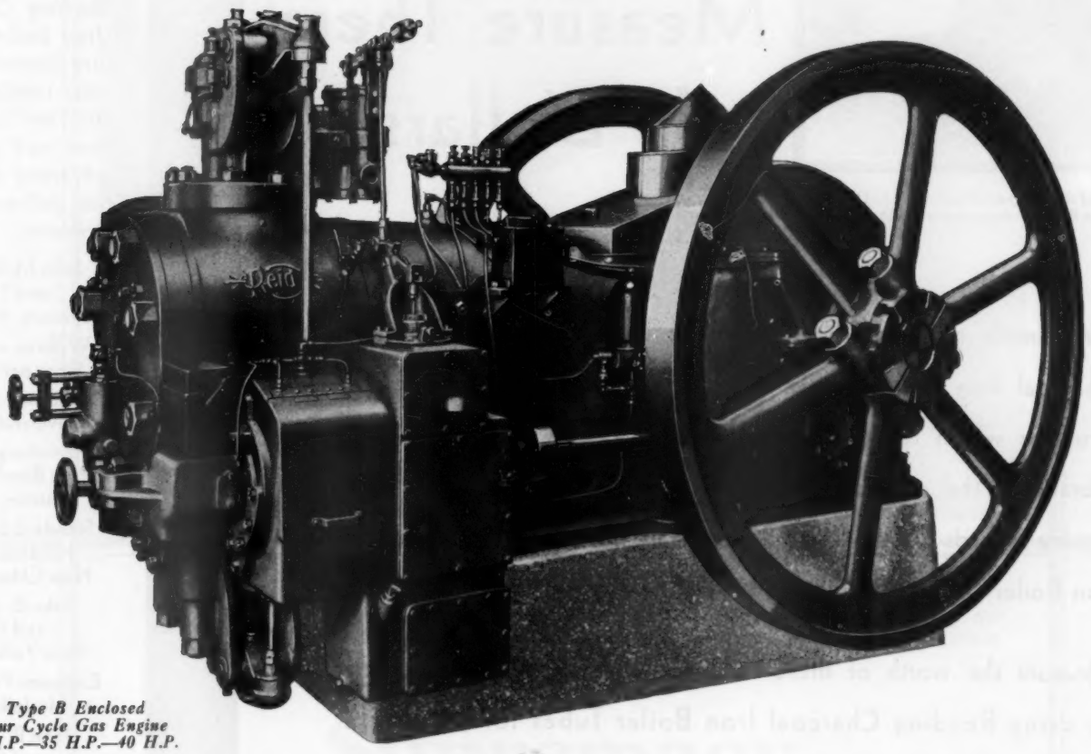
Distributors

Continental Supply Co., all stores; Wilson Supply Co., Houston and Beaumont, Tex.; Hercules Supply Co., Dallas, Tex.; T. T. Word Supply Co., Lake Charles, La.; Murray-Brooks Hdw. Co., Lake Charles and Hackberry, La. *Exclusive Export Agents,* W-K-M Co., 74 Trinity Place, New York, N. Y.

The Brewster COMPANY~INC.
SUCCESSORS TO OIL CITY IRON WORKS INC.
Shreveport, Louisiana

Ask about other Brewster API Products: Shouldered Tool Joints; Chrome Nickel Drill Collars, Six Blade Rock Bits; Special Gumbo and Fish Tail Bits; Cutter Heads for both soft and hard formation (the Cutter Heads for hard formation are faced with a substance of diamond-like hardness).

BALANCED POWER



Type B Enclosed Four Cycle Gas Engine 30 H.P.—35 H.P.—40 H.P.

WHEN you see a Reid Four Cycle Gas Engine in operation, you are instantly aware of its balanced power. Whether its load is light or full capacity, it will be running with a steady, smooth motion that can be obtained only with the proper balance. Let our representatives explain in full detail the many features of Reid Four Cycle Gas Engines. Ask at any branch or agency.

JOSEPH REID GAS ENGINE COMPANY, OIL CITY, PENNSYLVANIA, U. S. A.

BRANCHES:

Marietta, Newark, and Logan, Ohio; Charleston, W. Va.; S. R. Shoup, 724 Board of Trade Building, Los Angeles, California.

EXPORT SALES REPRESENTATIVE—Oilfield Equipment Co., Inc., 30 Church Street, New York City.

DISTRIBUTORS:

Frick-Reid Supply Corp., Pittsburgh, Pa., and Tulsa, Oklahoma, Distributors for Bradford and Pittsburgh, Pa., Kentucky, Oklahoma, Kansas, Texas, Arkansas, Louisiana and Wyoming; R. B. Moore, Bolivar, N. Y.; distributed in California by The Republic Supply Co. of California, office address, 2122 East Seventh St., Los Angeles, Calif.

REID OIL FIELD MACHINERY

View of boiler room of the Southern Pacific *S. S. El Occidente.* Reading Charcoal Iron Boiler Tubes are used in these boilers.

Simple Facts— Measure Them In Dollars!

Two simple money-saving facts make up the case for Reading Charcoal Iron Boiler Tubes. First, these tubes have an inherent structure which resists corrosion. Second, they are immune to vibration—the constant throbbing of the engines. That is why service records of from 15 to 20 years are not unusual for Charcoal Iron Boiler Tubes in industrial boilers!

Measure the worth of these facts for yourself in dollars saved by using Reading Charcoal Iron Boiler Tubes for your next installation. To insure that you get time-tested, long-lasting Genuine Charcoal Iron, the stencilled name "Reading" appears on every tube.

READING IRON COMPANY, Reading, Pennsylvania

Atlanta · Baltimore · Cleveland · New York · Philadelphia
Boston · Cincinnati · St. Louis · Chicago · New Orleans
Buffalo · Houston · Tulsa · Seattle · San Francisco
Detroit · Pittsburgh · Ft. Worth · Los Angeles · Kansas City

Reading Charcoal Iron Boiler Tubes are furnished in sizes ranging from 1½" to 6" in diameter and may be obtained through the following distributors:

John McKenzie and Co.
Baltimore, Maryland

Williams and Co.
Cincinnati, Ohio

Williams and Co.
Cleveland, Ohio

Harrisburg Pipe & Pipe Bending Co.
Houston, Texas

Standard Supply & Hardware Co.
New Orleans, La.

John B. Astell and Co.
New York, N. Y.

Eagleston Parke, Inc.
Norfolk, Va.

John B. Astell and Co.
Philadelphia, Pa.

Williams and Co.
Pittsburgh, Pa.

Export Agents, Wonham, Inc.
New York City

READING PIPE
CHARCOAL IRON BOILER TUBES

By Invitation Member

An installation of Darling Gate Valves at the Magnolia Petroleum Company's St. Louis, Oklahoma, Plant. These valves are used on their discharge lines, air lift installations and subject to pressure varying from 350 to 1000 lbs. with temperature from 150° to 300° F.

Supremacy

In every industry there is some one product that by sheer merit and outstanding quality and performance is accepted as the standard by which other products may be judged.
In the oil industry it is Darling Gate Valves.

Whether for drilling, conveying or refining the absolute supremacy of Darling Gate Valves has long been recognized by the "blue book" of the industry.

DARLING VALVE & MFG. CO.

WILLIAMSPORT, PA.

NEW YORK CHICAGO OKLAHOMA CITY HOUSTON

Mid-Continent Distributors:

Frick-Reid Supply Corporation
International Supply Co.
Atlas Supply Co.
Petroleum Supply Co.

California Distributor
Petroleum Equipment Company, Los Angeles

DARLING
GATE VALVES

608

An Electric Power source of *proven* Economy

The CLARK Generator Unit has thoroughly demonstrated its economy and dependability as a source of electric power, wherever electric power is desirable.

This unit consists of CLARK 4-cylinder, vertical gas or gasoline engine of 90 H.P. at 400 R.P.M., direct connected to Generator—75 k.v.a., 3-phase, 60-cycle, 400 R.P.M. Portability, automatic lubrication, balance, accessability and endurance are features. Full details on request.

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Compressors and Gas Engines

CLARK

SPEED—*instant* ON *and* OFF

SAFETY—*single handle—no slipping*

SPEED? It's built into every detail of W-K-M Petol Tongs—from lightness of handling, to action on the pipe. They take hold instantly with a bull-dog grip. The harder you pull and lunge, the firmer they set themselves. When the joint is "bucked up", just lift off the tongs—they release instantly and you are ready for the next joint. THAT'S SPEED!

SAFE? W-K-M Petol Tongs have only one handle. No possible danger of pinched fingers or mashed hands. No sudden slip of the tongs around the pipe to cause a violent fall. THAT'S SAFETY!

PERFECT ratcheting, and positive automatic grip make W-K-M Petol Tongs the easiest handled and least tiring of any on the market. Result—more work accomplished in less time.

W-K-M Petol Tongs are built to take punishment. Every part is of the finest grade of steel suited for its own work. They are absolutely guaranteed against breakage.

USE them everywhere pipe tongs are called for. Even in narrow trenches, or when pipe is flat on the ground, they can be used without lifting the pipe. Use them as back-up tongs — they adjust themselves and no movement of the pipe can loosen them.

TO "buck-up" the tough joints, a short length of pipe can be slipped over the handle to get extra leverage.

FILL out the coupon at the bottom right of the page and let us show you just what W-K-M Petol Tongs will do.

W·K·M ∫PETOL∫ PIPE TONGS

"The tongs with the hungry 'bite'."

The W-K-M CO., Inc.

OIL FIELD-PIPE LINE & INDUSTRIAL EQUIPMENT

HOUSTON - TEXAS

EXPORT DEPARTMENT: 74 TRINITY PLACE, NEW YORK, N. Y.

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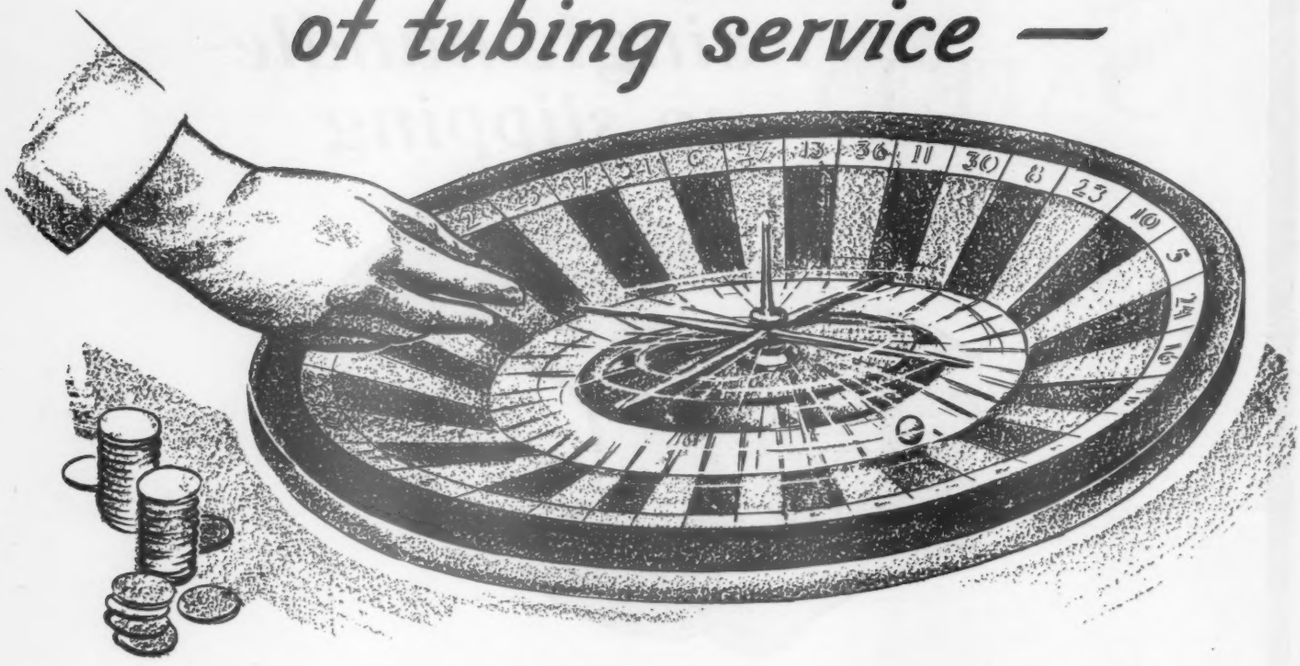
W-K-M COMPANY, Inc.
Gentlemen:

☐ Am interested in your Petol Pipe Tongs. Please send field man to demonstrate tongs to us at no obligation on our part.

☐ Kindly send literature covering the distinctive features of W-K-M Petol Pipe Tongs.

O.&G.J. 8-29-29

WROUGHT IRON
takes the gamble out of tubing service —



YOU don't take any chance when you specify genuine wrought iron tubing of BYERS make, because wrought iron has long demonstrated its ability to give two to five times greater service than ordinary pipe material. A large number of service records in oil fields everywhere conclusively demonstrate the superior qualities of corrosion resistance displayed by BYERS Tubing.

Why gamble with cheaper material? Why risk expensive interruptions and delays, due to premature tubing failures? Insist on genuine BYERS. It will keep faith with you as it is now doing with hundreds of others.

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Established 1864 Pittsburgh, Pa.

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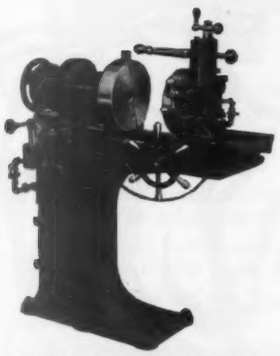
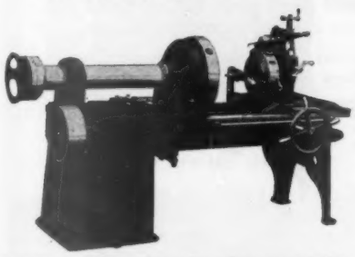
Galvanized TUBING

No fuss or trouble



No. 2 B & K Improved Pipe Machine. Pipe capacity ¼" to 2" diameter.



No. 2 and No. 3 Peerless Improved Pipe Machine. Capacities ¼" to 2" and ¼" to 3" respectively.

No. 2 PDQC Improved Pipe Machine with single pulley drive and Landis Die Head. Pipe capacity ¼" to 2".

Rear view of machine, showing constant speed motor drive. All gears are shielded.

PEERLESS B&K DUPLEX P·D·Q·C

THERE is usually plenty of trouble in the oil fields without having to fuss with piping and casings. Bignall & Keeler Pipe Threading Machines have won an enviable reputation among oil field men for doing their work speedily, accurately and without fuss or trouble.

Bignall & Keeler machines have demonstrated their worth by giving dependable service in oil fields for over half a century. They are preferred by shop men because they show lowest production costs and seldom require any repairs. Bignall & Keeler machines are made in 17 types and sizes for all threading requirements. Our catalog gives complete details.

Bignall & Keeler Machine Works
of the N. O. Nelson Mfg. Co.
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O&GJ 8-29 Gray

"Hydrogen Sulphide INCREASES COSTS—why not eliminate it"

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The Koppers Liquid Purification Process is successfully purifying a half billion cubic feet of gas daily—and paying for itself over and over again, in many prominent plants the country over.

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Some of the Franklin OF Good Points

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- 100% interchangeability
- Simplicity
- Piston rod is fitted with metallic packing which never needs adjusting or replacing
- Every spring exposed
- Complete simplicity with practically no adjustment
- In case of belt breakage engine automatically stops
- Fuel pump driven by eccentric running in oil bath
- Bearings are removable and reversible
- Only standard threads used. No special wrenches required
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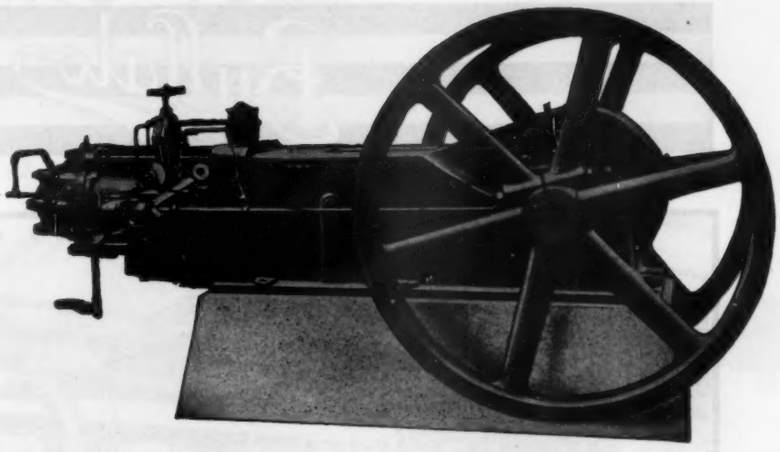
- Balance of lubrication is splash feed
- Pistons are air cooled
- All nuts subject to vibration are castillated and fastened with cotter pins
- Most economical to operate in fuel, lubricant, water and repairs
- Easy to start



Here Is Practical Standardization

The new and improved Franklin Oil Engine, identified as type OF is made in three sizes: 12x16 (40 HP) and 13x16 (50 HP) and 16 x 16 (80 HP) for drilling, pumping and power.

ALL FRANKLIN VALVELESS 16" STROKE ENGINES ARE INTERCHANGEABLE ON THE SAME BLOCK

After drilling the well, the operator can install one of the lighter units upon removal of the drilling engine. It fits the same block perfectly.

It is to the operator's interest to see that his drilling contractors use the Franklin since by doing so the cost of a new engine base is eliminated.

Here is practical standardization in which the benefits are mutual.

Send for literature.

Type BG Clutch for Cable Tool Drilling or Pumping

- A vast improvement over the former type of clutches.
- Driven from pulley on engine. Permits the use of a larger diameter pulley and makes possible a slower clutch speed. Operates by hand lever on derrick.
- Construction and design prevent Reverse Clutch Troubles.

PRICE—$1200.00 F.O.B. Franklin, Penna.

Franklin Valveless Engine Company
Franklin, Penna.

PRICES

12 x 16 Type OF Franklin, including water circulating pump and pulley. *$1550 F.O.B. Franklin*

13 x 16 Type OF Franklin, including water circulating pump and pulley. *$2050 F.O.B. Franklin*

16 x 16 Type OF Franklin, including water circulating pump, pulley and air starting equipment. *$3200 F.O.B. Franklin*

NOTE—Type OF is readily converted into type OG for gas fuelization.

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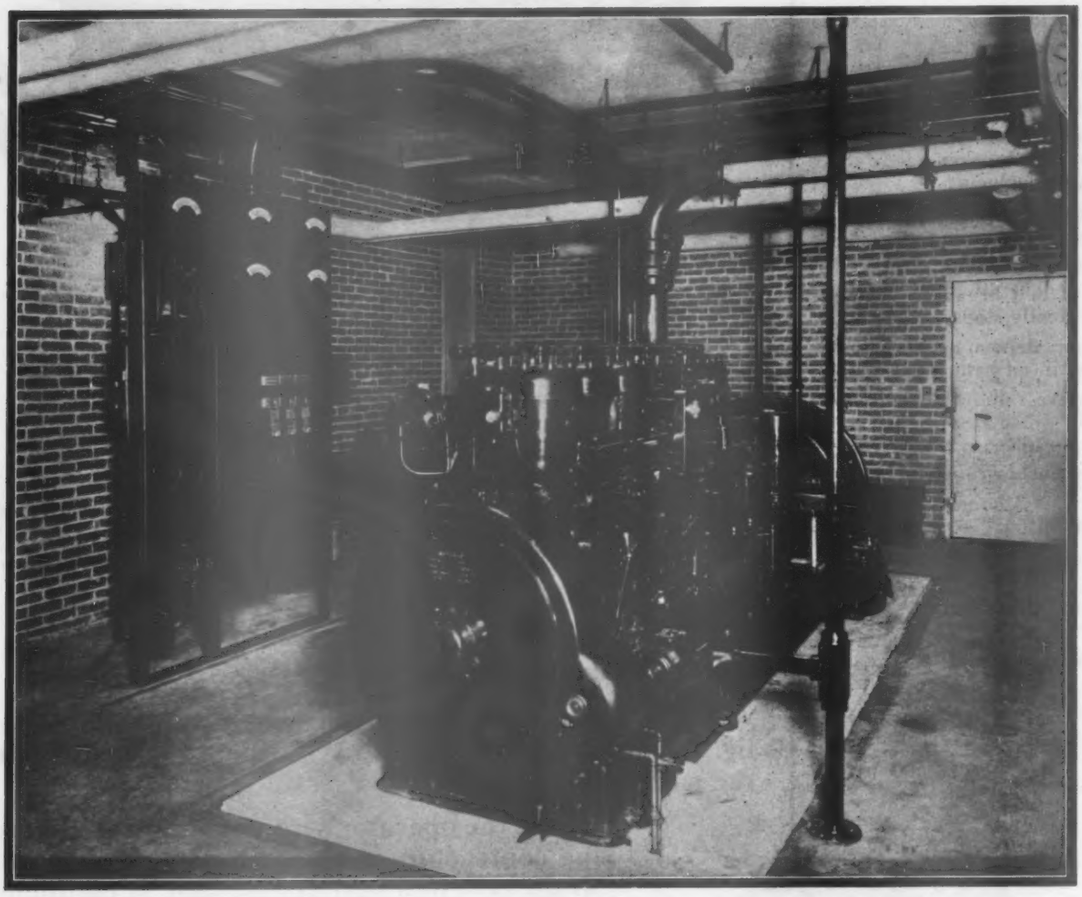

BUFFALO type "ATT"—six cylinder, installed in Oklahoma.

An Ideal Auxiliary Engine for Pipe Line Service, Gas Compressor and Oil Pumping Stations

High over-all efficiency; gas consumption being less than 9 cu. ft. per B. H. P. hour at full load.

This engine is heavily constructed for continuous service. Can be converted for gasoline operation when gas supply becomes inadequate.

FOUR and SIX CYLINDER
50 to 200 H.P.

Our Engineers are at your service. Complete catalog describing these engines will be sent on request.

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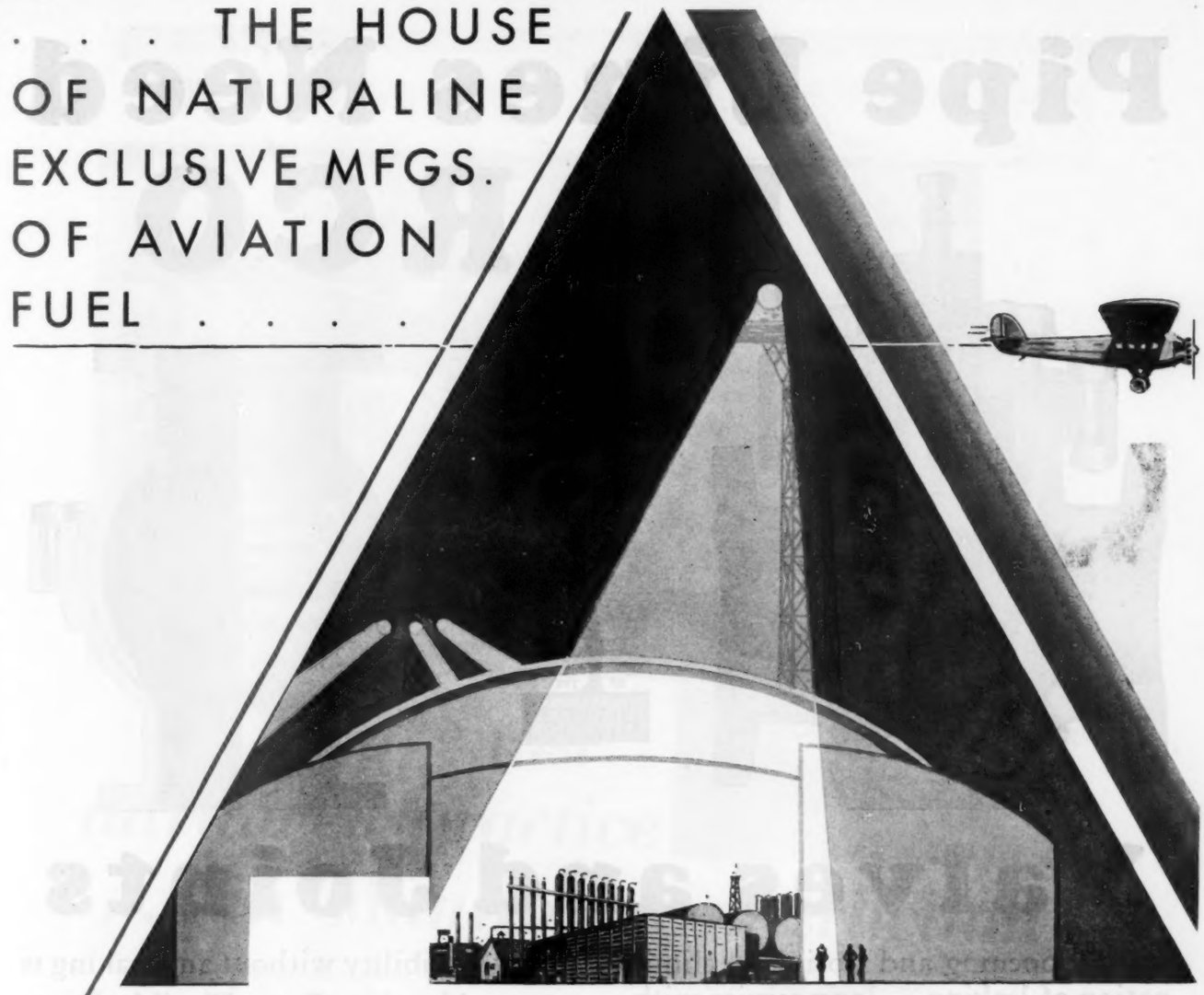
. . . THE HOUSE OF NATURALINE EXCLUSIVE MFGS. OF AVIATION FUEL . . . .



The Naturaline Company of America makes only NATURALINE—"the super aviation fuel". No other companion product shares the active and enthusiastic interest of everyone associated with "the house of Naturaline"—working happily in the production of only Naturaline—the finest of aviation fuels. • • Naturaline is completely balanced. It is made entirely from one source of raw natural gasoline in one plant, assuring its continuous uniformity and high quality. "Naturaline" is the exclusive property of the Naturaline Company, and is registered in the United States Patent Office. Similar sounding names should not be confused with Naturaline, which is the original product of NATURALINE COMPANY OF AMERICA, Chestnut and Smith Building, TULSA, OKLA.

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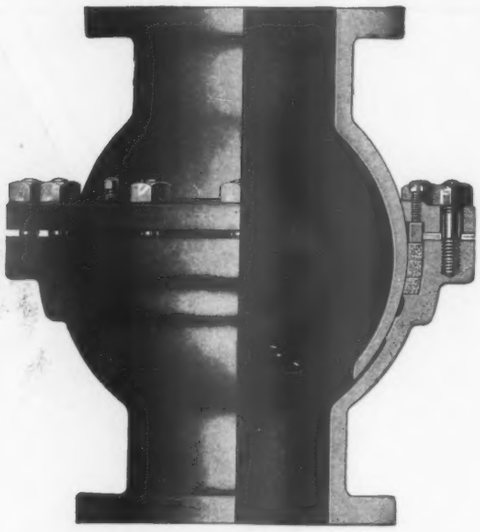
THE SUPER AVIATION FUEL

No gasoline made from crude oil is comparable with NATURALINE

Pipe Lines Need BARCO



Valves and Joints

Instant opening and closing — elimination of leaking — long service with practically no attention — these are some of the advantages of Barco Lubricated Plug Valves for pipe line service.

Easy flexibility without any leaking is secured by these Barco Flexible Joints in pipe lines of all kinds. Over 1,000,000 of these joints in service are proving their economy and long life.

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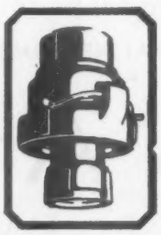
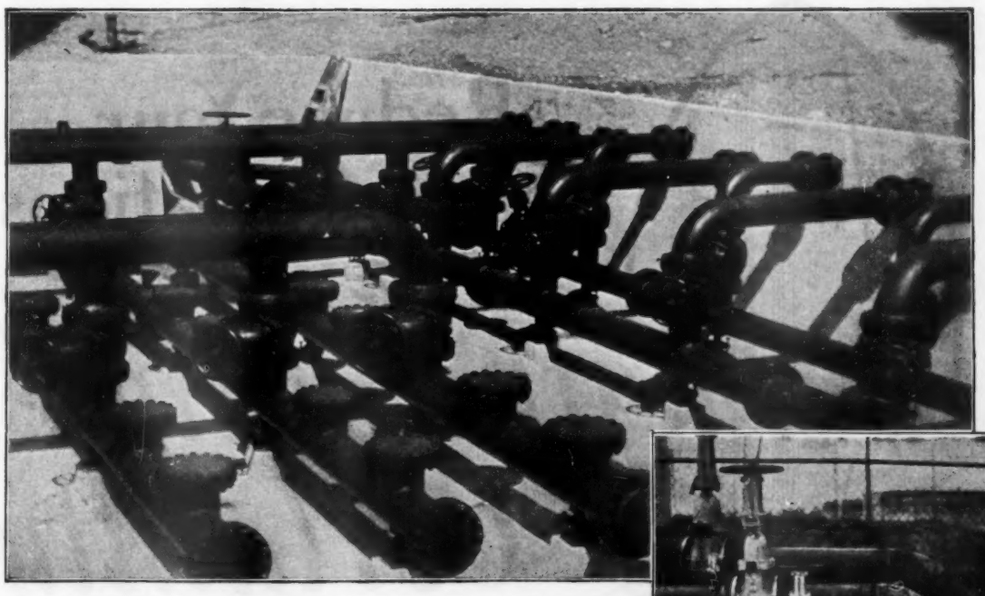
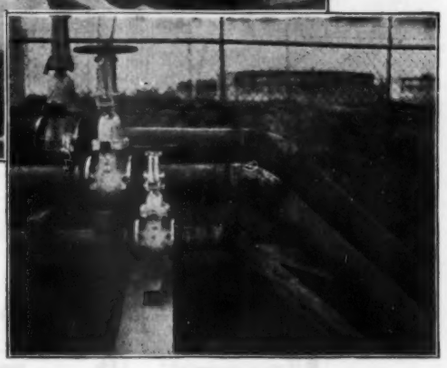


Valves and Joints

O&GJ 8-29 Gray



10" and 12" TUBE-TURNS in a Pipe Line Manifold.



The most advanced practice . . . in Manifold construction

THIS all-welded manifold fitted with TUBE-TURNS *represents the most advanced practice in manifold construction.* . . Welding produces what has thus far proven to be the only *permanently tight joint.* . . TUBE-TURNS are *stock fittings* specially designed for the welded job. They provide strength at all temperatures and pressures *equal to the piping with which they are used.* Their smooth inner walls offer minimum resistance to flow on short radius turns. . . In pipe lines TUBE-TURNS materially lessen turbulence and reduce pressure drop—hence lower pumping costs. As they can be cut on the job to any desired angle, a small stock will provide any change in direction, saving the time and expense of making hot or cold bends in the field. TUBE-TURNS, *Incorporated,* 1252 Logan St., Louisville, Ky.
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Reduce Your Coring Operations to a *Mathematical Certainty*

Other methods may fail and correlations prove disappointing, yet there is one method which will determine to a mathematical certainty the formations you drill and enable you to *know* every foot of the way. That is to core with an Elliott Cable Tool Core Drill.

The Elliott has been instrumental in turning apparently unsuccessful ventures into investments of great value, simply through eliminating guesswork and haphazard methods. The percentage of core recovery frequently is 100%. And, it is an established fact that *Elliott costs* per foot of perfect core recovered *are less.*

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CORE DRILL

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Entire Industry Watching California

Highest daily average estimated total production in 1928, week ended Dec. 29, 2,585,844 bbls. Lowest in 1928, May 19, 2,338,241 bbls.

Operators Believe Success Will Attend Reasonable Enforcement of Natural Gas Conservation Measure

By Andrew M. Rowley

Highest daily average estimated light oil production in 1928, week ended Dec. 29, 2,158,134 bbls. Lowest in 1928, Mar. 3, 1,927,713 bbls.

What success the State of California and progressive operators there will have in making effective the natural gas conservation law which is scheduled for enforcement starting August 31 is probably the most important consideration in the crude petroleum situation at this time. It has been estimated drastic enforcement of this measure would automatically curtail crude oil production in California by 200,000 barrels daily but few operators or state officials are quite that optimistic. It probably will require at least 15 days to put into effect the plans for enforcement of the law and efforts at the beginning, at least, will be confined to those flush fields where there is a great excess natural gas production and consequent waste of this fuel.

State officials of California have expressed themselves as confident comparatively little difficulty will be encountered in enforcing the law on a reasonable basis and executives of the larger oil companies in California have assured the State of their active co-operation. A big factor in the situation is the attitude understood to have been taken by the crude oil buyers in California that they will not purchase crude from leases tied up in litigation, it being expected that flagrant violations of the law will result in the State's endeavoring to prevent owners of those leases from operating the properties. If the pipe line companies refuse to take the oil from such properties, it is a foregone conclusion production on such leases will be curtailed.

It is an open guess how much production will be curtailed by operation of the law. If between 50,000 and 100,000 barrels daily is shut in, the industry should feel gratified.

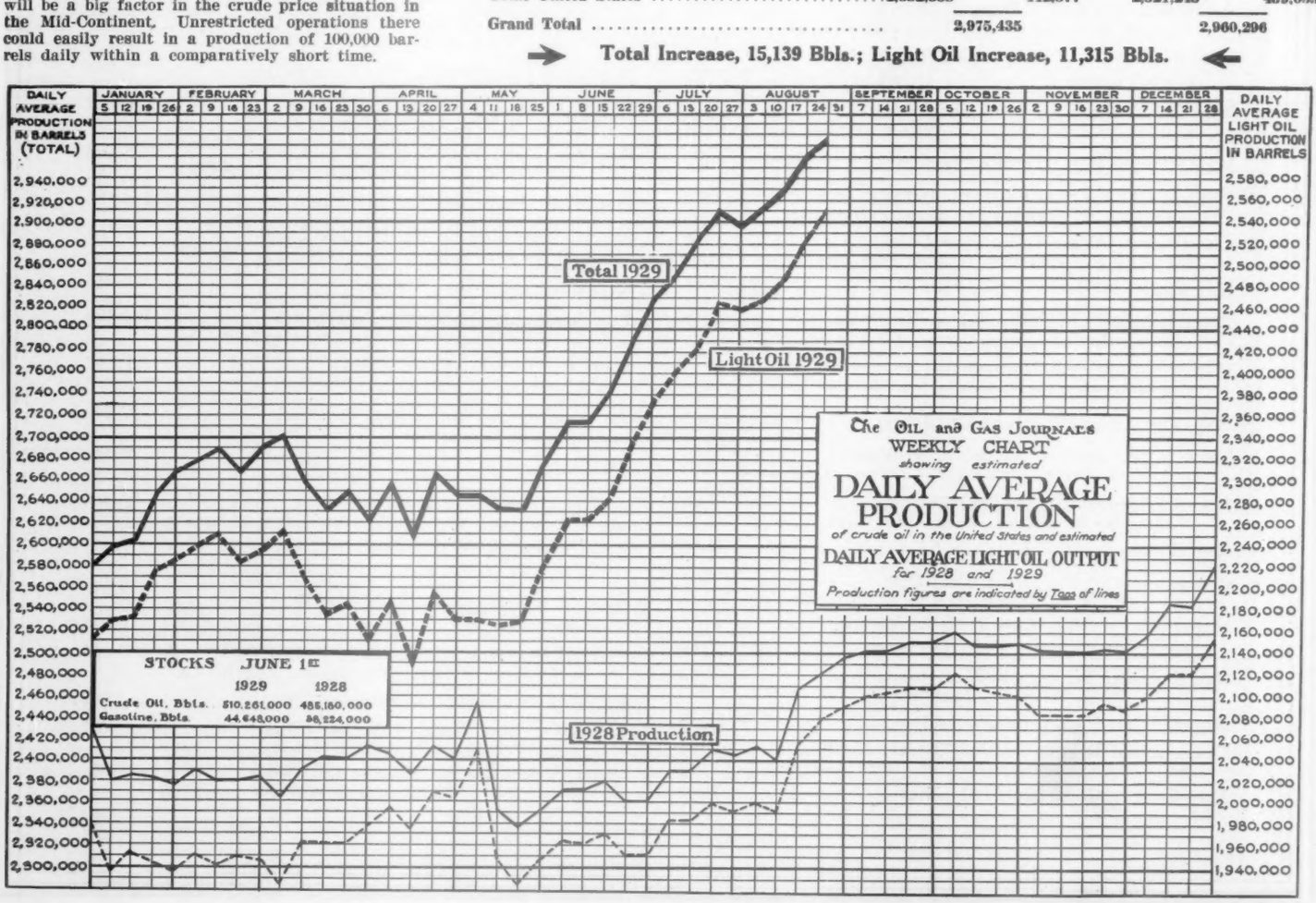
The Oklahoma City Pool is engaging the attention of operators in the Mid-Continent area and the success or failure to reach an agreement there as to holding production more nearly to requirements will be a big factor in the crude price situation in the Mid-Continent. Unrestricted operations there could easily result in a production of 100,000 barrels daily within a comparatively short time.

PRODUCTION IN THE UNITED STATES

Estimated daily average production of light and heavy gravity oil in the United States for week ended August 24 and a comparison with the previous week follows:

	Aug. 24		Aug. 17	
	Light	Heavy	Light	Heavy
Oklahoma—				
Oklahoma City	36,580	.....	34,675	.....
St. Louis-Pearson	71,015	.....	72,410	.....
Seminole	301,410	.....	300,095	.....
Northern Miscellaneous	261,115	.....	259,940	.....
Southern Fields	56,890	.....	55,950	.....
Total Oklahoma	727,010	.....	723,070	.....
West Texas—				
Hendricks	131,000	.....	135,177	.....
Yates	130,465	.....	138,393	.....
Remainder	115,689	.....	117,208	.....
Total West Texas	377,154	.....	399,778	.....
North Louisiana	29,990	6,450	30,329	6,310
Arkansas	20,580	46,100	20,045	46,305
North Central Texas	156,853	.....	154,749	.....
Texas Panhandle	133,624	.....	124,768	.....
East Central Texas	18,744	.....	19,149	.....
Kansas	128,340	.....	126,950	.....
Total Mid-Continent Area	1,592,295	52,550	1,588,838	52,615
Gulf Coast	.....	162,941	.....	158,142
Southwest Texas	.....	74,386	.....	76,296
Eastern	126,000	.....	126,000	.....
Rocky Mountain Area	78,763	.....	77,905	.....
California—				
Santa Fe Springs	295,500	.....	290,000	.....
Long Beach	170,000	.....	169,000	.....
Huntington Beach	43,000	.....	43,500	.....
Elwood	22,500	.....	23,000	.....
Ventura Avenue	61,000	.....	58,000	.....
Seal Beach	45,500	.....	46,500	.....
Remainder of State	98,000	153,000	97,500	153,000
Total California	735,500	153,000	727,500	153,000
Total United States	2,532,558	442,877	2,521,243	439,053
Grand Total		2,975,435		2,960,296

→ **Total Increase, 15,139 Bbls.; Light Oil Increase, 11,315 Bbls.** ←



Kerosenes and Distillates Advance

Natural Gasolines Also Higher in Oklahoma. Natural Gas Factor in Fall and Winter Demand for Fuel Oil

By C. O. Willson

Natural gasoline, kerosene and distillate prices advanced during the past week in the Oklahoma (Group 3) market in response to a steady demand. Some grades of high gravity fuel oil and bright stocks were also advanced by several refiners. These advances are largely nominal due to the fact the companies concerned have no material to offer for immediate shipment regardless of price.

The domestic grades of refinery gasoline continued steady in price throughout the week and the same prices are being quoted for delivery over the remainder of the month. Practically all of the larger refiners in the State are quoting 7¾ cents to the trade for the U. S. Motor gasoline and with rare exceptions the low on this product from other refiners the first of the week was 7½ cents. This difference of one-quarter cent between the high and low quotations is the narrowest spread since early in the year. A spread of one-half to 1 cent a gallon had been the rule since early summer.

Interest in gasoline including natural gasoline now centers in the September market. In September the domestic demand starts to decline although it is one of the largest consuming months of the year. The September consumption based on government figure is usually approximately equal to that of June.

There were no positive developments the first of the week pointing to the probable trend in the September U. S. Motor market. A few buyers reported quotations for delivery over the first 15 days of September under the prevailing spot market. On the other hand, several sellers stated that they were asking present quotations for delivery over any part of September. Probably in a majority of cases both buyers and sellers were unwilling to make any speculative purchases or sales for September delivery and are awaiting developments the first of the month.

Considerable depends on the attitude of export buyers. The August movement of high gravity gasoline to export buyers from the Mid-Continent was probably higher than any month this year. Some of the contract movement will continue through September but in other cases deliveries will be completed at the end of August. Very little export business has been placed since early in the month. One large exporter made inquiry for 390 endpoint material last week. The offer was made to North Texas refiners and was not accepted according to trade reports.

Some of the export buyers feel that a decline in gasoline export quotations at the Gulf Coast upon which the Mid-Continent market depends, is probable. It is pointed out that these prices which have not been changed for several months are now out of line with the prevailing domestic prices and some adjustment in price is necessary to meet competitive conditions in foreign countries.

Natural Gas Competition

In these columns last week a rather optimistic future for fuel oils including gas oil and distillate was outlined. It should be stated that not all market observers agree with that conclusion. The higher prices for these products over the fall and winter months was predicated on the assumption that no large decrease if any in posted crude oil schedules for Mid-Continent crude oil would materialize this fall.

Regardless of developments in the crude oil there are those who look for a continuance of relatively low fuel oil prices —particularly the lower gravity grades. Their contention is based on the constantly widening use of natural gas within the Mid-Continent area and the major consuming points to the north, west and east. Elsewhere in this issue will be found a map showing all the completed and projected natural gas lines. From the refiners' angle these lines unquestionably mean less fuel oil consumption. Outside the Mid-Continent the lines connect to Denver, St. Louis, Atlanta, Birmingham and Memphis and many intermediate

(Continued on Page 359)

REFINED MARKET BAROMETER

There were no unusual developments in the refined market over the past week. Reports from all sections of the country reflected a heavy consumption of gasoline which is probably now at the peak period of the year. With this heavy demand refiners in most cases were able to maintain prices on spot shipments. There is a tendency among some refiners to liquidate their gasoline stocks rapidly and this may be a factor in the September market. The strength in the kerosene market over the past week was sufficiently widespread to be termed general, higher prices developing at several interior refineries. With the approach of fall the furnace oil market is becoming more active and there is a general tendency among refiners to advance tank car prices. Fuel oil and gas oil prices were unchanged. Natural gasolines advanced in the Mid-Continent with no change in California. A reactionary trend in steam refined stocks and bright stocks on the East Coast furnished the only price development in lubricating oils. An advance in several grades of petroleum wax was the only price change in the wax market.

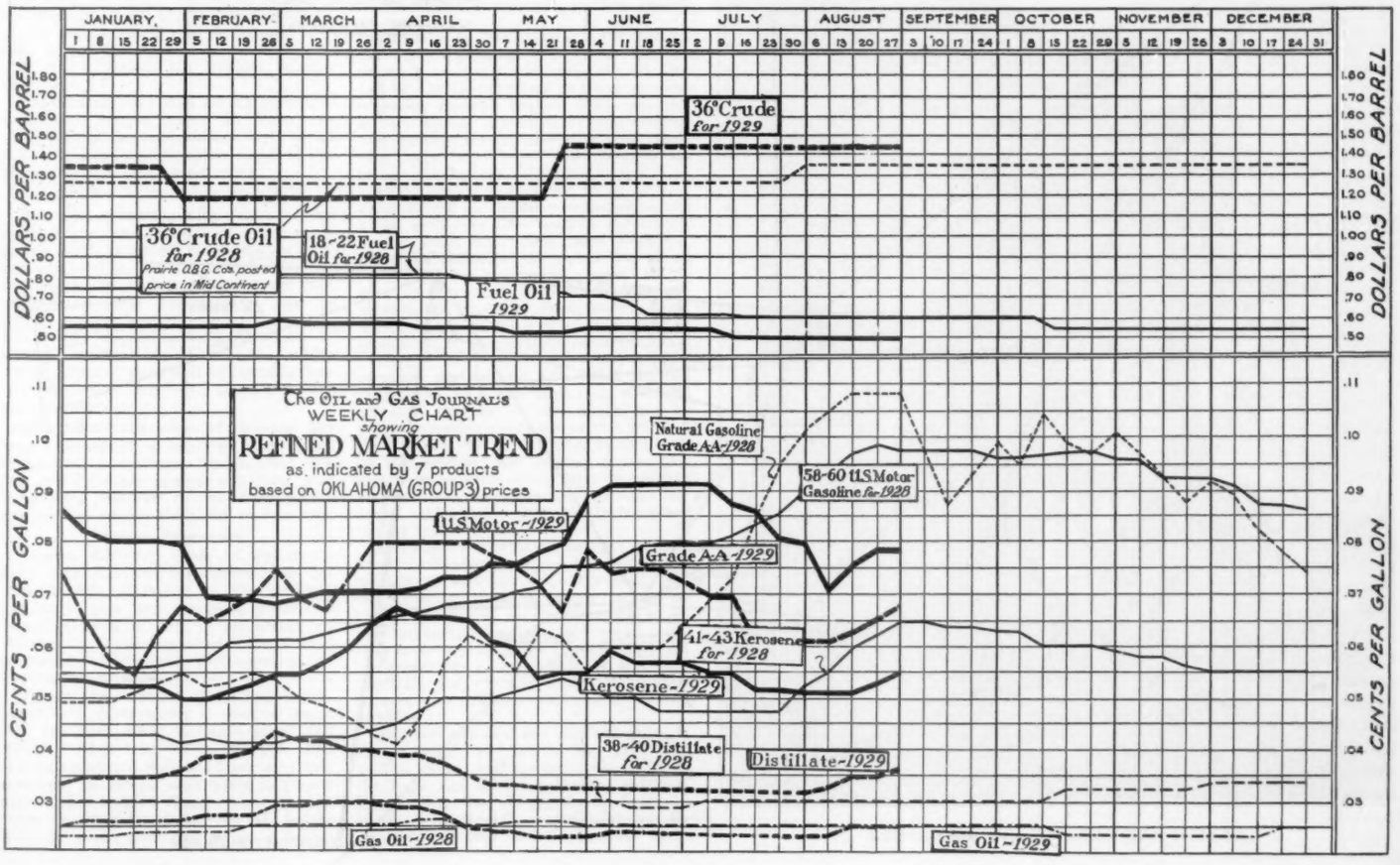
Mid-Continent—Refinery gasoline prices generally steady with heavy domestic movement. Natural gasoline prices higher in all areas. Kerosene and distillate strong and prices higher in Kansas, Oklahoma and North Texas. High gravity fuel oils and gas oil strong. Bright stocks strong. No change in wax.

Atlantic Seaboard—Gasoline market unsettled with continued wide range in tank car prices. Steam refined cylinder stocks and bright stocks fail to hold to prices of previous week and prices lower. Kerosene in better demand and prices steady. Several grades of paraffin wax higher. Fuel oil movement excellent and prices steady. No change in other products.

Pennsylvania—Gasoline prices unchanged. Higher gravity grades of kerosene advance. Lubricating oil prices steady except for reduction in one grade of neutral oils. No change in wax prices.

Chicago—Heavy movement of gasoline at steady prices. Natural gasolines advance. Kerosene strong and prices advanced when any changes are made. Higher gravity fuel oils advanced. Distillate and gas oil scarce. Lub oils firm.

Gulf Coast—Better demand for pale and red oils. Fuel oil market weak. No change in gasoline prices.



Pipe Lines Transport Natural Gasoline

Approximately 5,000,000 Bbls. of This Volatile Product Carried in California Lines During First Half This Year

By L. P. Stockman

Pipe line transportation of natural gasoline has become a very important factor in California during the past few years and the mileage of new white lines added during this period bears a direct ratio to the increase shown in production. The old practice of dumping natural gasoline into crude oil lines has been supplanted by more economical methods of transportation with the result that only about 11 per cent of the total production of natural gasoline is mixed with crude or other oils at the present time. This is considerably less than in the past as figures reveal that 36 per cent of the total 1926 production of natural gasoline was mixed with crude or other oils. In 1927 this practice had declined to 29 per cent and a further reduction took place in 1928 when the mixing of natural gasoline dropped to 15 per cent of the total output. The mixing of natural gasoline with crude oil to facilitate transportation has several obvious disadvantages and is only justified under certain conditions as the commingling of natural gasoline and crude oil results in double handling when the mixture reaches the refinery. Plant capacity is adversely affected and efficiency of operation reduced except in refineries having a wide latitude of operation and unusual flexibility. This practice also tends to void the high standard specifications which natural gasoline plant operators must meet in the field before any of the major companies will agree to purchase production. The only advantage enjoyed in mixing natual gasoline with crude is that it reduces the viscosity of crude oil and facilitates movement but it is very doubtful however if this practice is justified from an economic standpoint except where transportation is prohibitive and evaporation losses high. In areas where production is relatively small and does not justify the installation of pipe line facilities the mixing of natural gasoline with crude oil is of course justified but these cases are rather isolated.

PRODUCTION, DISTRIBUTION AND STOCKS OF CALIFORNIA NATURAL GASOLINE

(Barrels of 42 U. S. gallons)

1929—	Monthly production	Mixed with crude or other oils	Blended at refineries	Shortage and evaporation losses	Increase in stocks	Stocks on hand
January 1	.....	.....	.....	.....	.....	1,221,766
January 31	1,284,960	114,694	1,067,226	81,554	21,486	1,243,252
February 28	1,291,335	92,296	921,692	185,005	92,342	1,335,594
March 31	1,567,408	116,439	1,297,416	178,036	*24,483	1,311,111
April 30	1,544,994	150,086	1,207,684	102,383	84,841	1,395,952
May 31	1,562,267	232,076	1,156,800	58,148	115,243	1,511,195
June 30	1,601,609	255,839	1,247,256	67,690	30,824	1,542,019
First half 1929	8,852,573	961,430	6,898,074	672,816	320,253	9,560,859
Total 1928	12,984,374	1,901,685	10,240,259	839,211	622,550	.....
Total 1927	11,660,536	3,370,071	7,166,279	843,322	280,864	.....
Total 1926	9,270,627	3,296,518	4,689,610	1,054,222	253,753	.....
Total 1925	7,218,574	2,565,022	4,121,526	539,524	*18,448	.....

*Decrease.

NATURAL GASOLINE PRODUCTION IN CALIFORNIA

(Barrels of 42 U. S. gallons)

Field—	1929 January	February	March	April	May	June	Total
Fullerton (Brea Olinda)	31,417	27,691	31,644	31,288	30,548	29,646	182,234
Midway-Sunset	111,632	101,833	128,394	109,507	113,857	105,834	671,057
Huntington Beach	90,605	80,317	70,942	81,795	82,405	80,617	486,681
Long Beach	437,217	438,334	497,153	485,906	464,492	457,460	2,780,562
Richfield	37,630	34,346	38,263	35,859	35,727	33,934	215,758
Santa Fe Springs	214,397	263,077	391,033	369,669	394,883	460,333	2,093,352
Seal Beach	64,491	63,522	80,225	89,300	88,224	83,790	469,552
Ventura Avenue	141,740	131,078	150,933	147,315	154,587	161,015	886,668
All other fields	155,831	151,138	178,821	194,355	197,544	188,980	1,066,669
Total first half	1,284960	1,291,335	1,567,408	1,544,994	1,562,267	1,601,609	8,852,573

The importance of pipe line transportation in the natural gasoline industry is quite evident when one considers that approximately 5,000,000 bbls. of natural gasoline have been transported by pipe lines from producing areas to refining centers for blending purposes during the first six months of 1929. The greater part of this movement took place in Los Angeles Basin where white lines for the transportation of natural gasoline are quite numerous. These systems form a comprehensive network and obviously exert a very important part in the production, refining and sales of petroleum products on the Pacific Coast. The location of numerous prolific fields within a small congested area in the Los Angeles Basin makes this section particularly adaptable for the transportation of natural gasoline by pipe lines especially because of its proximity to tidewater and refining centers. Natural gasoline lines in the San Joaquin Valley on the other hand are less numerous because of the large expanse of area covered and the great distance between fields which extend southward from Coalinga in Fresno County to Wheeler Ridge in the extreme southern end of the San Joaquin Basin, a distance of about 100 miles.

The Shell Oil Co. has the longest natural gasoline line in the State of California at the present time and its aggregate mileage of main trunks for handling natural gasoline exceeds that of any other single company. The Shell's major installation is a combination 4 and 6-inch welded line and extends from the prolific Ventura Avenue Field southward to its Wilmington refinery at Los Angeles, a distance of 97.5 miles. The in-

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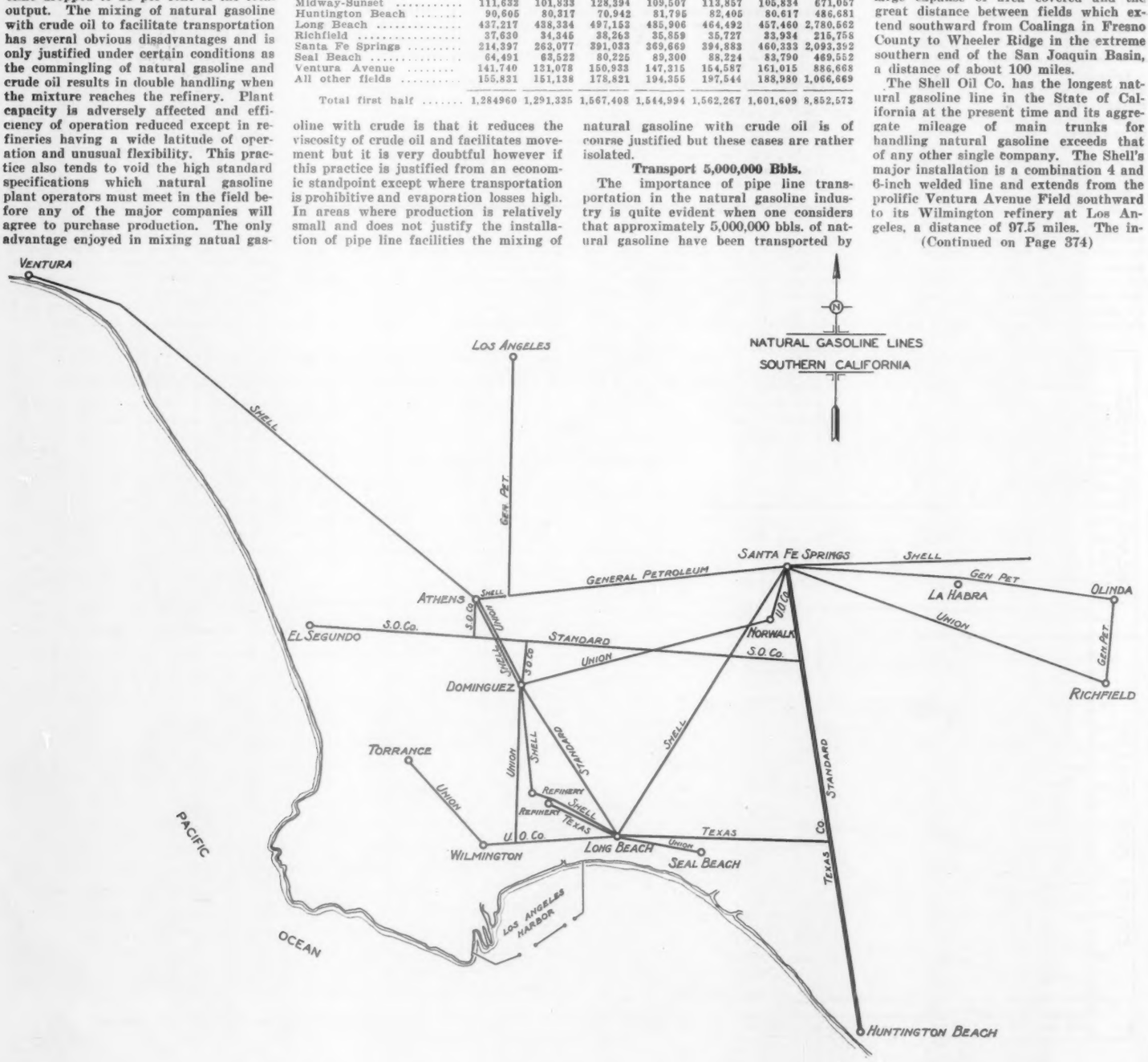

Corrosion Is Big Pipe Line Problem

Engineers of Different Companies Giving Considerable Study to This Subject. Research Covers Metallurgy and Types of Soil

By L. G. E. B'gnell
Petroleum Engineering Editor

Problems concerning the corrosion of pipe are by no means new, but the study of methods and means of preventing this destructive action is comparatively recent, although it is a very interesting fact to note that in Prof. W. J. M. Rankine's book, "A Manual of Machinery and Millwork" published in 1893, he quotes from a paper by Mallet, "On Corrision of Iron," in the "Reports of the British Association for 1843 and 1849," and outlines the electro-chemical theory of accelerated corrosion by saying, "It (corrosion) is also accelerated by the contact of iron with any metal which is electro-negative relatively to the iron, or, in other words, has less affinity for oxygen (such as copper) or with the rust of the iron itself."

His suggested methods of "preserving iron" contain among others the following:

1. Boiling in coal tar, especially if the pieces of iron have been first heated to the temperature of melting lead (621 degrees Fahrenheit).

2. Heating the pieces of iron to the temperature of melting lead, and smearing their surfaces, while hot, with cold linseed oil, which dries and forms a sort of varnish.

3. Painting with oil paint, which must be renewed from time to time. The linseed oil process is a good preparation for painting.

4. Coating with zinc, commonly called "galvanizing." This is efficient, provided it is not exposed to acids capable of dissolving the zinc; but it is destroyed by sulphuric acid in the atmosphere of places where much coal is burned. It lasts well at sea.

5. Coating with tin, applied to thin sheet iron.

Considering that this set of specifications was written about 85 years ago their general statements are well based and with some modifications many of the ideas are still being used today.

Coating With Other Metals

The idea of coating with zinc has been expanded to take in coats of many other metals, such as cadmium, chromium, copper and nickel, but unless the work is done with the utmost care and the thin metal coat made homogeneous, that is free of minute holes through the coating, which may appear quite satisfactory to normal inspection, but if examined under a high powered glass will be found broken with numerous tiny holes, the results are unsatisfactory.

This same character of trouble has been experienced in applying some types of protective coatings, for as they dry and set little air spaces will form and these holes penetrate entirely through the coating and expose the metal underneath.

Testing Apparatus

Several different types of apparatus have been designed for determining the homogeneous character of the coatings applied to pipe and a typical method is described by E. P. Bly in his article on "Corrosion of Underground Pipe Lines" published in Petroleum Development and Technology in 1926.

Briefly this consists of placing a prepared steel plate under a wooden frame that has been made moisture proof and filling the box with 20 to 60 mesh sand that is moistened with a 15 per cent salt solution. A second steel plate is placed inside the wooden frame and pressed down to come in contact at all points with the moist sand and serves a double purpose of covering the sand and also acting as an electrode.

The resistance of the sand and coating is measured by connecting the under and upper plates to a Wheatstone bridge which includes a sensitive galvanometer. Voltage is then applied to the two plates by a suitable method and will flow through this system when the protective coating on the bottom plate breaks down sufficiently to complete the electric circuit.

The method is not entirely new and the United States Bureau of Standards has used a similar method for comparing the ability of various coatings to withstand stray current electrolysis.

Variations of this method have been devised by several engineers both for making the penetration tests of coatings as well as making field soil tests and they have the advantage of being portable and can be taken to any point along the line where tests are desired and easily and quickly set up for operation.

Another method of determining the corrosive power of soils, is by chemical analysis which requires from three to four days to complete and gives the percentages of the substances in the soil, which either by themselves or in combination form salts that are detrimental to metal buried underground.

The United States Bureau of Standards has issued a very complete review of its work on "Soil-Corrosion Studies" in Technologic Paper No. 368 prepared by K. H. Logan, S. P. Ewing and C. D. Yeomans.

Another method of testing is by means of an earth current meter which is quick and accurate and its applications are fully described in another Technological Paper prepared by the United States Bureau of Standards, No. 351, by Burton McCullom and K. H. Logan.

Metallurgical Research

There has been a good deal of work done by the research laboratories of the pipe manufactures to improve the metallurgy of the material used in making pipes for various purposes and numerous alloys have been developed and tried, but

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Varied and Unique Uses for Old Pipe

Many Useful and Serviceable Articles Improvised in the Petroleum Industry Out of Old Pipe, Tubing and Casing

By L. G. E. Bignell
Petroleum Engineering Editor

The old familiar cry of the junk man, "Any rags, any bones, any bottles today," is not heard around the oil fields to any great extent, for the oil companies have found so many and varied uses for their old equipment that the junk man would not make a very good living there. It is, of course, quite true there are many tons of iron and steel scrap shipped out of the oil fields every year, but, in the main, this material has passed all possible hopes of using it for anything further, and so it has been condemned to the remelt process.

The oil man has always had a reputation for ingenuity and never has he shown it to better advantage than in the use of old pipe, tubing and casing. One traveling through the oil fields can get a very liberal education of the cutting and welding art by observing how many uses have been found for material no longer fit for its original purpose.

Pipe, tubing and casing to be of real value to the oil industry, whether in the wells, gathering lines around the leases, in the main pipe lines that convey it from the fields to the refineries, or at the refineries themselves, must be of such quality that it is tight and the threads are good and joints do not leak. Whenever it passes out of this class of equipment it immediately becomes junk.

But, if as junk, it were immediately scrapped and sold for $10 to $12 per ton there would be a very large item of charge off each year for tubular goods, and to make as much further use of this rejected pipe as possible it is usually turned over to the welding and cutting department and used in some other form to provide articles too numerous to mention, but all of which have their particular place in the industry.

The exhaust stacks on the gas engines for the compressor or gasoline plants are usually formed out of old casing, and the type of stack is about as varied as the number of companies using internal combustion engines. In some cases it is necessary to design these stacks with the possibility of making quick and easy renewals, for where gas high in sulphur is used the exhaust stacks will corrode quickly.

Another popular use for old pipe is the runways and stairs for pipe line loading racks, and around tanks both on the lease and at the gathering stations. Ingenuity in the nth degree is shown in some of the details worked out by the welders, for they usually proceed without any predetermined plan, and simply follow a set of general measurements taken at the job.

Guards and rails for all manner of purposes are made out of old pipe, and since discarded rock bits are becoming available in numbers in most fields, the

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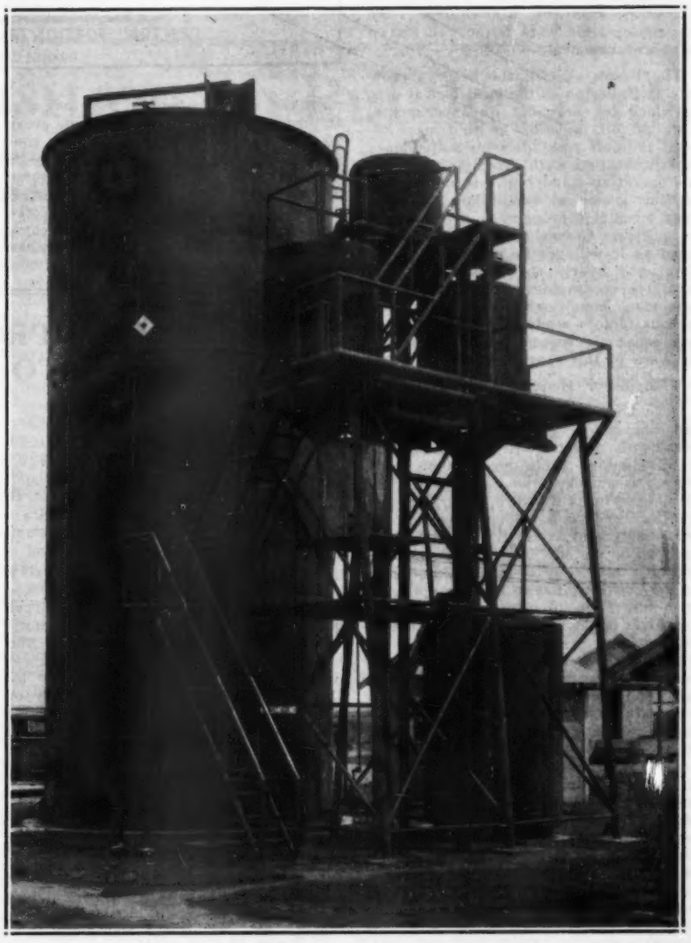


Stairways and supports welded from used pipe.

Union Storing Oil in Depleted Sands

Upon Recommendation of Engineers, California Company Is Carrying on Experiment of Importance to Industry

By L. P. Stockman

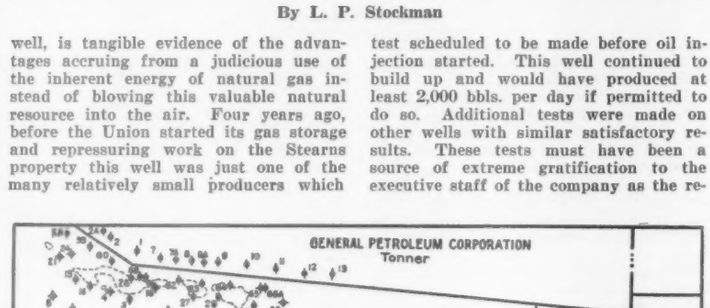
LOS ANGELES, Calif., Aug. 26.—The Union Oil Co. has just instituted an experiment to determine the feasibility of utilizing depleted oil sands for the storage of crude oil. The significance and importance of such an undertaking is quite obvious and it is needless to say that the industry will watch the results with considerable interest. It might be mentioned in passing that this company pioneered gas lift operations and extensive repressuring work on a major scale in California several years ago and the success attained was primarily responsible for the subsequent institution of similar progressive work by other companies. The advantages accruing from air and gas lift operations have been recognized by the industry for many years and although several operators used this method of stimulating production before the Union, this company was the first to inaugurate a definite comprehensive gas conservation program on a major scale. This work involved several fields and approximately $500,000 was expended by the company in the laying of natural gas lines and for the erection of absorption and compressor plants and other equipment necessary for the injection of dry natural gas in the Brea Olinda, Richfield and Huntington Beach Fields. The success which the company has enjoyed from this conservation work is too well known to require comment.

The Union selected the Stearns property at Fullerton as the most logical area in which to carry out its experimental work on oil injection as this lease offered the best possibility for satisfactory experimentation both from a geological and operating standpoint. In addition to existing geological conditions, the company owns this property in fee and will be at liberty to conduct its work unhampered as it will not be obliged to worry about any lessees royalty interest. Its favorable geographical location, existing subsurface conditions and other advantageous factors render the Stearns property especially susceptible to experimental work of this character.

Engineers Recommended Work

Considerable study and preliminary experimentation was undertaken to determine the practicability and feasibility of oil injection before the Union's engineers recommended the initiation of further experimental work under actual working conditions. No. 46 Stearns was accordingly selected as the injection well and while no special hook-up was required a number of tests were conducted on this well in order to formulate a basis upon which to predicate future deductions. It might not be amiss to mention the fact that the Union Oil Co. had already successfully repressured the Stearns property with surplus natural gas and subsequent tests indicate that this work has greatly increased the company's future ultimate recovery of crude oil and natural gasoline. No figures are available as to the Union's total crude oil reserve in producing fields and undrilled proven acreage but it is generally admitted that this company's future reserve is second only to the Standard. The Union is therefore assured of an ample supply to meet its requirements for many years to come before being obliged to develop its extensive holdings of shale land which incidentally are owned in fee.

No. 46 Stearns, the new oil injection well, is tangible evidence of the advantages accruing from a judicious use of the inherent energy of natural gas instead of blowing this valuable natural resource into the air. Four years ago, before the Union started its gas storage and repressuring work on the Stearns property this well was just one of the many relatively small producers which form the real backbone of the industry. It turned out its 150 bbls. of crude every 24 hours and would probably have continued to produce for several years to come although the output would of course continue to reflect the axiomatic normal decline as time went on. Imagine the engineers' amazement when this well came back flowing 650 bbls. per day when turned loose last week on the preliminary test scheduled to be made before oil injection started. This well continued to build up and would have produced at least 2,000 bbls. per day if permitted to do so. Additional tests were made on other wells with similar satisfactory results. These tests must have been a source of extreme gratification to the executive staff of the company as the results shown greatly exceed even the most sanguine expectation and more than justify the extensive repressuring campaign carried on during the past several years.



Use Santa Fe Springs Crude

After flowing No. 46 Stearns for several days without noting any visible diminution in the flow of oil or decrease in gas pressure, preparations were at once started to institute oil injection. It had been decided beforehand to utilize crude oil from Santa Fe Springs where the company is producing more than 60,000 bbls. daily from its own leases. This oil was also a very satisfactory medium because of its composition as the chemical analysis to be made upon conclusion of the oil injection experiment is expected to show conclusively just which oil is being produced. The sulphur content and other components will probably form the basis for a very complete test. After satisfying themselves that No. 46 Stearns would probably continue producing at a high rate for some time to come, the Union's engineers shut in the well and made the necessary minor connections to proceed with oil injection. The plan followed does not show any departure from recognized engineering practice. The crude oil is pumped down into the oil sand between the tubing and the casing simultaneous with the introduction of natural gas through the tubing. In gas lift operations used for the purpose of stimulating crude oil production the natural gas is introduced between the tubing and the oil string and rises vertically up through the tubing. The operating pressures behind the oil and gas are being withheld in conformity with engineering ethics but data especially released for this story indicates that No. 46 Stearns is taking 3,500 bbls. of crude oil and 500,000 feet of natural gas daily.

It must be remembered that although the oil injection experiment which the Union is carrying on in the Fullerton or Brea Olinda Field of Orange County is purely of an experimental nature every indication points toward a successful conclusion. The oil zone underlying the Stearns property is particularly adapted to storage and repressuring operations and I am confident that the outcome of present experimentation will prove this practice both feasible and advantageous. The zone which had previously been repressured and is now being tried out as a natural reservoir for the storage of crude oil is a southerly dipping monocline composed of conglomerates and coarse sands interbedded with sandy shales and is somewhat lenticular save for the basal conglomerate. The effective porosity of this zone is rather high as evidenced by the production history of the property in question. It ranges in thickness from 700 feet to 900 feet, the major part of which is coarse sand. This is an especially important factor as the porosity or voids between the sand grains is especially favorable for the introduction of large volumes of crude oil and should conversely permit a much larger ultimate recovery than would ordinarily be expected. As a matter of fact in all probabilities the company may get more oil out than is pumped in. This deduction seems to be in direct opposition to axiomatic laws of oil recovery but it must be remembered that considerable quantities of natural gasoline will also be recovered in addition to actual crude oil production. Another favorable factor is the quality of crude being injected. This is especially important as the light Santa Fe Springs crude and natural gas should tend to blend with the Stearns crude and by reducing the viscosity result in a larger ultimate recovery. Based on the theory that approximately 25 per cent of the total oil in an oil sand can be recovered by ordinary methods we must assume that there is still 75 per cent of the original oil present in the Stearns sand. It appears logical therefore that if the recovered 25 per cent is again pumped back in it should ultimately be recovered, provided of course that the original gas volume and pressure is

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LAMP SAYS OVERPRODUCTION CANNOT BE FORCED INTO INCREASED DEMAND

NEW YORK, Aug. 27.—"Overproduction of crude or refined products cannot be forced into increased consumption regardless of price," Standard Oil Co. of New Jersey will say in forthcoming issue of The Lamp, its official publication.

Under the heading, "The Overzealous Refiner," the article states:

"A weak gasoline market at the very peak of a record-breaking season of consumption and a weaker fuel oil market are the reflections of the industry's failure to regulate its own operations in line with market requirements. The overproduction of crude has been translated by the refiners into an overproduction of gasoline. The oil industry with its hundreds of thousands of investors faces the peculiar situation of a record-breaking consumption of products yet with earnings far below those being shown by other industries that have not enjoyed a comparable gain in business.

"Since overproduction starts at the mouth of the well let us see what the producer has done to prevent himself from earning a fair return on his capital and skill. In the first half of the year 45,000,000 bbls. of all oils went into storage and it is estimated that during the latter half of the year there will be a further addition of at least 15,000,000 bbls. This means that after taking care of every barrel of increased consumption there will be overproduced this year in the United States an average of 5,000,000 bbls. per month.

"The principal product from crude is gasoline. Gasoline has to carry not only its own proportion of the cost of obtaining crude and refining it but also must absorb the loss on the lower grade products which sell below the price of crude. With crude oil in such liberal supply refiners in all districts disregarded statistics of the amount of finished products they would be called upon to supply in their locality and increased their runs to a greater extent than justified by the gain in consumption. The result was that throughout the first half of this year the primary problem of overproduction of crude was carried forward into the no less embarassing problem of overproduction of gasoline. As a result there was accumulated in this period in the United States 8,400,000 bbls. of gasoline. In the first six months of the previous year the accumulation was 1,500,000 bbls.

"The industry can find no fault with the manner in which sales of its principal

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Some Problems in Deep Well Pumping

Various Suggestions Offered for Improvement of Technique in Operations in Connection With Deeper Wells

By Paul Williams
Petroleum Engineer, Pure Oil Co.*

In deep well pumping it is necessary that the operator be exceedingly discriminate in the selection of pumping equipment and particular in the adjustment of variables in operating methods if he is to be successful in avoiding excessive down time due to failure of equipment. It is not possible to name any one type or series of types of equipment or any method of operation which will be so far superior to other equipment, or other methods of operation as to act as cure-alls for the difficulties encountered in deep well pumping, but marked advantages may be obtained by careful attention to all variable details. In this discussion it is proposed to enumerate some of the common contributing factors to uneconomical operation: the importance of these factors is assumed to be not fully appreciated as is evidenced by their general prevalence.

Alignment

In view of the devastating effects of improper alignment of the various working parts of the pumping rig and in consideration of the comparative ease with which proper alignment may be secured, it seems that operators would have long since eliminated trouble which is directly attributable to this source. Such is not the case; alignment in a large percentage of instances continues to receive much less consideration than is commensurate with its direct effects upon performance of and service from equipment.

The design of a large portion of pumping equipment is based on cut and try methods, or at best, assumed or theoretical loads. The need for an exact knowledge of working loads is eminent. A start and some progress has been made in this direction in recent months by dynamometer analyses of rod loads; but a more detailed continuation of this work, in which the loads may be traced and tabulated through the entire pumping layout, is desirable as a basis for correct design of equipment. Further, it is desirable that the causes of variations in loads be determined so that the loads may be anticipated for any given set of pumping conditions and proper equipment may be selected to meet these conditions.

The general practice of operating single cylinder gas engines at excessively high speeds (450 to 600 r.p.m.) when pulling and running rods and tubing is to be condemned, as most engines of this type are not designed for such speeds; and the resulting damage far outweighs the value of the time saved.

The common methods of applying belt clamps is the cause of uneven distribution of load across the belt and too high initial belt tension which sometimes results in unnecessarily overloading clutch and band wheel shafts and bearings. It is therefore desirable that some relatively easy method be developed to determine tension and distribution of load in belts.

Counterbalances

No attempt will be made to discuss the relative merits of the various types of counterbalances; but too much stress cannot be laid on the advantages to be derived from a careful and proper adjustment of any type used. Unnecessarily high rod loads are resultant from both overcounterbalancing and undercounterbalancing. It is obviously desirable that there be no reversals of forces on any of the equipment; therefore the counterbalance should be lighter than the rod load on the polished rod upstroke and heavier than the rod load on the polished rod downstroke; generally this may be most successfully accomplished by weighing the well and adjusting the counterbalance so that its mean effective weight is equal to the average polished rod load.

Grasshopper type counterbalances actuated by wire lines or pitmans suspended from tailpieces on walking beams are in common use. It is advisable to suspend this type counterbalance by means of a rigid and only slightly elastic connecting link to the tailpiece when operating with single cylinder gas engines as the stretch in comparatively elastic wire line causes radical fluctuations in the effective weight of the counterbalance (due to the impulse of the engine) such fluctuations being necessarily imposed upon the remainder of the pumping equipment. It may readily be seen that a sudden reduction of the effective weight of the counterbalance will result in a corresponding load increase on crank, bandwheel, belt, clutch and engine. The magnitude of these fluctuations will vary as the elasticity of the counterbalance pitman.

At most wells which are properly counterbalanced the weight of the rod string is considerably less than the weight of the counterbalance; as shown by dynamometer tests, the weight of fluid column is not supported by the rods when the well is not in operation. Therefore, a well which is properly counterbalanced when operating is decidedly overcounterbalanced when shut down. This condition causes some difficulty in starting the well pumping. Great care should be exercised in starting such wells. There seems to be a natural tendency towards speeding up the engine and suddenly "throwing in" the clutch; the resulting high acceleration to the inert parts subjects them to damaging loads. It should be recognized that duration of load is not more conducive to failure of equipment than magnitude of load; it is possible that excessive failure of equipment at some wells is largely attributable to this factor.

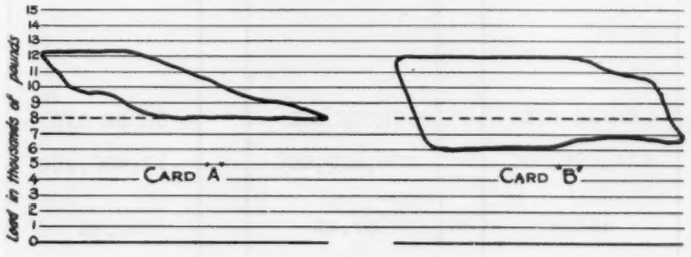

Figure 1.

The effectiveness of the rotative type counterbalance is influenced not only by its total weight and the position of its center of gravity with respect to the axis of the bandwheel shaft but also is influenced by the position of its center of gravity with respect to the longitudinal axis of the crank. In as much as each well presents an individual counterbalancing problem no set rules may be offered as a general solution, but it should be kept in mind that the counterbalance (particularly the rotative type, due to its high degree of adjustability) is by far the most flexible controlling element in proper distribution of loads throughout the equipment. It is possible to reduce polished rod load appreciably by an adjustment of the counterbalance which will dangerously overload some of the remaining equipment. A a matter of fact, in deep well pumping the counterbalancing problem is economically worthy of and should be handled by a specialist as the proper adjustment of any type on every well is an intricate physical problem.

Card No. 1, Figure 1, shows the polished rod load at a 4,000-foot well pumping at twenty-two 42-inch strokes per minute with no fluid in tubing; note that

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*This is the third of a series of articles on crude oil production. The first appeared August 15 and the second August 22.

Hoover's Position on Public Lands

Western Governors Told of Administration's Policy Regarding Permits for Oil Development

President Hoover's position regarding the granting of permits for oil development on the public domain was stated in a letter to Joseph M. Dixon, First Assistant Secretary of the Interior, and presented by Mr. Dixon at the Public Land States Governor's Conference, held at Salt Lake City on Monday and Tuesday of this week.

In this letter President Hoover said in part:

"It may be stated that our western states have long since passed from their swaddling clothes and are today more competent to manage much of these affairs than is the Federal Government. Moreover, we must seek every opportunity to retard the expansion of federal bureaucracy and to place our communities in control of their own destinies. The problems are in large degree administrative in character both as they affect the Federal Government and the government of the states.

"It seems to me that the time has come when we should determine the facts in the present situation, should consider the policies now being pursued and the changes which I might recommend to Congress.

"That these matters may be gone into exhaustively and that I may be advised intelligently, I propose to appoint a commission of 9 or 10 members, at least five of whom should be chosen from leading citizens of the Public Land States, and I should like to secure the co-operation of the governors by submission from them of names for such a commission. This commission would naturally co-operate with the Department of the Interior.

Mineral Resources

"The policies to be pursued in development and conservation of mineral resources of the public domain present many problems. They are problems of a national as well as a local character. I know that the western as well as the eastern states agree that abuse of permits for mineral development or unnecessary production and waste in our national resources of minerals is a matter of deepest concern and must be vigorously prevented.

"Because of such abuse and waste I recently instituted measures to suspend further issue of oil prospecting permits on public lands and to clean up the misuse of outstanding permits, and thereby to clear the way for constructive conservation. It may interest the governors to know that when this decision was taken on March 12 there were prospecting permits in force covering over 40,000,000 acres of the public domain. We have now determined that over 40 per cent of these holders had not complied with the requirements of the law, that the large portion of these licenses were being used for the purpose of preventing others from engaging in honest development and some even as a basis of "blue sky" promotions. After yielding to the claimants, the widest latitude to show any genuine effort at development under the outstanding prospecting permits, the total will probably be reduced to about 10,000,000 acres, upon which genuine development is now in progress. The public domain is, therefore, being rapidly cleared of this abuse. The position is already restored to a point where measures can be discussed which will further effectually conserve the national resources, and at the same time take account of any necessity for local supplies.

"These suggestions are, of course, tentative pending investigation of the full facts, but generally I may state that it is my desire to work out more constructive policies for conservation in our grazing lands, our water storage and our mineral resources, at the same time check the growth of Federal bureaucracy, reduce Federal interference in affairs of essentially local interest and thereby increase the opportunity of the states to govern themselves, and in all obtain better government."

Mineral Subsurface Rights

Mr. Dixon in his address before the conference stated that possibly the question had arisen in the minds of some of the governors, what about the mineral subsurface rights? Why should they not also be turned over, as a gift to the public-land states?

In this connection Mr. Dixon stated:

"I will give you the reason why that very thing is neither desirable nor to be hoped for at this time.

"In the first place, there is no public-land state that has the equipment absolutely necessary for scientifically handling the vast mineral resources underlying the public lands. The Federal Government is spending, and for years has been spending, more than $1,000,000 per year in the maintenance of its geological survey. Here we have a force of about 500 highly trained men at work, in making most comprehensive surveys and studies of our coal, oil, phosphates, potash, metalliferous ores, topographical surveys, stream gauging, underground water supply and their related subjects.

"This work is particularly a national

(Continued on Page 359)

Sources of Gasoline Supply Changing

Approximately 50 Per Cent of Increased Output Is Cracked Gasoline and Natural Gasoline. California Operations Expand

By C. O. Willson

Cracking installations at refineries and natural gasoline plants so far this year are furnishing approximately 50 per cent of the increased supply of gasoline for domestic and export buyers.

Total gasoline production for the first six months of this year increased 35,031,000 bbls. over the same period last year, according to Bureau of Mines reports. Of this total 17,808,000 bbls. of straightrun gasoline was skimmed from crude oil, 10,140,000 bbls. of cracked gasoline were obtained from fuel oil and gas oil and 7,083,000 bbls. of natural gasoline were extracted from casinghead gas of oil wells and natural gas wells.

Thus, one-half of increased production of gasoline is due to the greater crude oil runs to stills of refineries and the remaining half is accounted for by the enlarged operations and greater efficiency of cracking plants and natural gasoline plants. This situation has been summarized with the paraphrase that "refiners and natural gasoline plant operators are drilling as many wells as the crude oil producers."

The situation in regard to gasoline supply as summarized in Table 1 is not an overnight development. Over a period of 15 years cracked gasoline and natural gasoline have rapidly increased in importance in furnishing a part of the world's motor fuel supply. Previously, the so-called straightrun gasoline obtained from crude oil in a skimming operation was practically the sole source of gasoline. As cracked gasoline and natural gasoline increased in volume, straightrun gasoline has decreased in importance and this situation obviously has tended to lessen the volume of additional crude oil required to supply a constantly increasing demand for gasoline.

Observers who have watched this development over a period of years believe the time is not far distant when the increased demand for gasoline will be supplied without additional crude oil supply. This goal in fact has been accomplished by a number of refinery operators and in certain areas as shown in Table 2 very little additional crude oil is being run to stills although the increased output of gasoline this year has been sufficient to take care of a normal increase in demand.

The importance of cracked gasoline and natural gasoline in the motor fuel supply becomes more apparent when the data on operations east of California are considered. There has been an abnormal increase in crude oil runs to stills at California refineries so far this year. There has also been an exceptionally large increase in cracked gasoline and natural gasoline in California but not as great proportionately as the increase in crude oil runs to stills. For this reason the California operations tend to minimize the importance of fuel oil and gas oil and casinghead gas as raw material in the manufacture of gasoline.

East of California

East of California (Table 1) 45.7 per cent of the increased supply of gasoline came from crude oil, 35.7 per cent from fuel oil and gas oil and 18.6 per cent from casinghead gas. Even in this area, however, there was an exceptional increase in crude oil runs to stills for the first six months reflected in the fact that the production of straightrun gasoline increased 10,618,000 bbls.

California Operations

California operations in the refinery and natural gasoline divisions have been as outstanding as they have been in the production of crude oil. In crude oil production, California, for the first six months of this year, based on government figures, furnished 29,024,000 bbls. of a total increase of 52,551,000 bbls. in the United States including imports.

The California production of straightrun gasoline from crude oil increased 32.5 per cent. This was brought about by an increase of 14.8 per cent in crude oil runs to stills. The new crude oil supply in California is higher in gravity than the old supply and this was responsible for a greater yield of gasoline in the skimming operation.

California cracking operations have also expanded rapidly as shown by the fact that the output increased 55.7 per cent the first six months of this year over the same period last year. California refiners have been slow in adopting cracking processes and the output compared to the straightrun production is still relatively small.

The newer crude oils in the Los Angeles Basin are not only giving the refining industry there a higher gravity crude oil with which they secure a large yield of straightrun gasoline but has also given a better cracking stock. It is certain that the output of cracked gasoline in California will continue to increase despite an overproduction of crude oil which has resulted in low crude prices.

In natural gasoline, California production increased 2,755,000 bbls. the first six months of this year, exceeding that of any other area except Oklahoma and Kansas, which increased 3,414,000 bbls. This increase of 45.2 per cent in California natural gasoline production has given a surplus in excess of West Coast requirements and substantial quantities have been sold to East Coast and export buyers. With this large increase in all grades of gasoline California production to a greater extent than ever before has dominated the motor fuel market in the United States so far this year. This situation promises to continue over the remainder of the year.

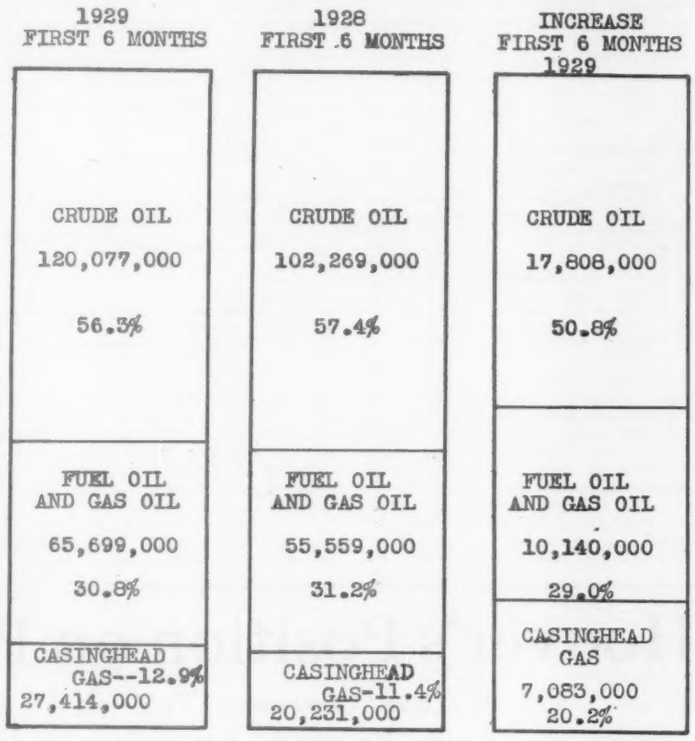

Chart showing gasoline production from three grades of raw material first six months of 1929 and 1928. Increase first six months of 1929 also shown. Data based on Table 1.

Other Areas

The situation in several of the eastern refining areas is in contrast to that prevailing in California. Along the East Coast for example the refiners increased their crude oil runs to stills 1.5 per cent. However, their production of straightrun gasoline increased 4.4 per cent and that of cracked gasoline 13.9 per cent. This meant that the East Coast refiners with a very small increase in their crude runs to stills were able to increase their gasoline output sufficient to take care of a normal increase in demand.

In the Rocky Mountain area where there has been very little change in the quantity of crude oil available, refiners the first half of this year increased their crude oil runs to still 2.3 per cent. Their production of cracked gasoline increased 15.4 per cent.

In the Appalachian area which includes an inland group of refiners in Pennsylvania, New York, eastern Ohio and West Virginia, the refiners as a unit increased their crude oil run to stills 8.5 per cent. The increase in straightrun gasoline was only 2.9 per cent. This was probably due to the fact that some low gravity West Texas crude oil is now being transported inland by pipe line from the East Coast to Penn-

(Continued on Page 360)

TABLE 1—GASOLINE PRODUCTION—FIRST SIX MONTHS, 1929 AND 1928
(Data given in barrels)

UNITED STATES

	1929	Pct. of total	1928	Pct. of total	1929 increase	Pct. of total
Straightrun gasoline from crude oil	120,077,000	56.3	102,269,000	57.4	17,808,000	50.8
Cracked gasoline from fuel oil and gas oil	65,699,000	30.8	55,559,000	31.2	10,140,000	29.0
Natural gasoline from casinghead gas	27,414,000	12.9	20,231,000	11.4	7,083,000	20.2
Total	213,190,000	100.0	178,059,000	100.0	35,031,000	100.0

UNITED STATES—EAST OF CALIFORNIA

Straightrun gasoline from crude oil	90,745,000	53.4	80,127,000	54.7	10,618,000	45.7
Cracked gasoline from fuel oil and gas oil	60,559,000	35.7	52,258,000	35.6	8,301,000	35.7
Natural gasoline from casinghead gas	18,562,000	10.9	14,236,000	9.7	4,326,000	18.6
Total	169,866,000	100.0	146,621,000	100.0	23,245,000	100.0

TABLE 2—GASOLINE PRODUCTION IN UNITED STATES BY AREAS
(First six months 1929—Data in Barrels)

	Straightrun gasoline			Cracked gasoline			Natural gasoline		
	1929	Gain over 1928	Pct.	1929	Gain over 1928	Pct.	1929	Gain over 1928	Pct.
East Coast	14,884,000	635,000	4.4	11,168,000	1,368,000	13.9	(*)	.....	....
Appalachian	5,192,000	148,000	2.9	2,553,000	471,000	22.6	1,287,000	4,000	.3
Indiana, Illinois, etc.	16,715,000	3,043,000	22.2	12,866,000	2,769,000	27.4	169,000	†10,000	†5.5
Oklahoma, Kansas, etc.	18,306,000	1,431,000	8.4	9,964,000	887,000	9.7	10,847,000	3,414,000	45.9
Texas	24,230,000	4,222,000	21.1	16,040,000	1,509,000	10.4	4,645,000	862,000	22.7
Louisiana and Arkansas	7,457,000	1,142,000	18.1	4,331,000	812,000	23.0	1,078,000	47,000	4.5
Rocky Mountains	3,979,000	15,000	.4	3,637,000	485,000	15.4	538,000	14,000	2.6
California	29,332,000	7,190,000	32.5	5,140,000	1,839,000	55.7	8,852,000	2,755,000	45.2
United States	120,077,000	102,269,000	17.4	65,699,000	10,140,000	18.3	27,176,000	20,331,000	33.6
Gulf Coast	21,493,000	19,082,000	12.6	17,348,000	1,852,000	11.9	(*)	.....	....

*No natural gasoline production. †Decrease.

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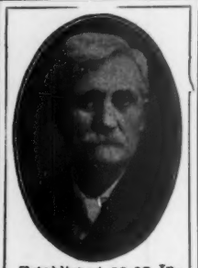

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THE REAL OIL RESERVE

When they talk of the nation's reserves of oil most people, both in and out of the industry, think of the great potential production indicated in the now known fields and sands.

The country's real oil reserve is in the personnel of the research and engineering organizations of the industry.

Research in the manufacture of petroleum products is saving more than a million barrels a day; in effect drilling more wells in the refineries than in the field and without a dry hole.

In the first six months of this year the cracking process produced 65,689,000 barrels of gasoline, to produce which, on the basis of 40 per cent recovery, would have required 165,000,000 more barrels of crude, or 910,000 barrels a day.

This was a gain of 10,000,000 barrels over the past year, a saving of 25,000,000 barrels of crude or 138,000 barrels daily.

We also produced 27,000,000 barrels of motor fuel from natural gasoline equivalent to the saving of another 67,000,000 barrels of crude or 370,000 barrels a day.

Only 15 years ago production of motor fuel by cracking or from natural gasoline had not been commercially developed. Today those two processes resulting from research are saving an equivalent of 1,300,000 barrels of crude a day.

That is one great reserve of oil which has been developed by research, yet research in the manufacture of petroleum products has just started. Certain lines of investigation now under way may almost completely change our manufacturing methods. One phase promises 100 per cent recovery of motor fuel from a barrel of oil.

There had been practically no change in the manufacture of lubricating oil in 50 years. The remarkable progress in the past five years is significant of what may be expected from research.

Research is not only adding to our reserves by saving millions of barrels of crude in manufacturing an equal quantity of products but is vastly enlarging our known reserves by scientific methods of finding, producing and handling oil.

Time was when oil was regarded as a gamble rather than an industry or a business. Men sought oil in the hope of sudden fortune, groping for it, hit or miss fashion, on hunches, sheer luck as often as not being their sole dependence. Hundreds of thousands of acres were leased on the mere chance that an oil pool might be found.

In fact in comparatively recent times even the larger companies relied on wholesale leasing as their chief reserve.

Research has changed all that. The coming of the geologist was the first indication of the switch to science. After the initial success there was a tendency to overdo it, to expect too much from it. Eventually a conservative course was adopted and geological departments were established by companies upon a scientific basis.

About the same time the old secretive mystery-making traditions of every man for himself began to give way to co-operative research. The larger companies began the exchange of information in the geological and land departments with mutual advantage.

From this development dates the evolution of core drilling, the correlation of formations and the mapping of underground structures, followed by the wide development of geophysical exploration and work on the crooked hole problem.

This change in the fundamental conception of reserves from a mere acreage basis to known structures has transformed the oil industry from a gamble to a serious business. It has brought out a new type of executive alert to the possibilities of science and research and planning for the future on a sound structure of known reserves in the field or in manufacturing efficiencies.

Instead of blind wholesale leasing science has guided the oil companies to the selection of potential pools. One company has acquired leases in over 300 areas that have been proven by geophysical methods to be over structures.

Experience, however, has taught the industry, somewhat dearly, that engineering research can have disconcerting results.

The air-gas lift was an example of what happened when science was let loose without proper regard for consequences. Now executives are considering the economics of engineering research as well as the mechanics. Overdoing engineering may be as disastrous as underengineering. It must be properly considered and planned with relation to economic effects as well as physical results.

There is no longer any question of the mechanical results. The engineers have shown their competency in that regard. At Seminole the actual recovery is very high, being about 35 per cent of the theoretical saturation of the sand body.

The experience in Bradford is an illustration. There was a field that had been producing since 1875 and was thought passing out of the picture. Research was employed and it is producing more now than it was 30 years ago and will produce more under modern engineering methods than it did under ordinary methods of flowing and pumping. It has increased its production 500 per cent over its output a dozen years ago.

The study of geothermal gradients is being pursued by government scientists in four stations in different sections of the oil country for the analysis of water and the taking of temperature in older wells. The relationship between temperatures underground and the contour of structures has been found startlingly similar in Salt Creek and elsewhere, suggesting a valuable addition to our fund of knowledge regarding the location of oil.

Farsighted executives no longer have to rely on extended leasing campaigns to accumulate possible reserves, running the risks of a wild scramble for production on discovery and resulting overproduction. Research is assuring them of potential production that can be developed as needed, conservatively and efficiently.

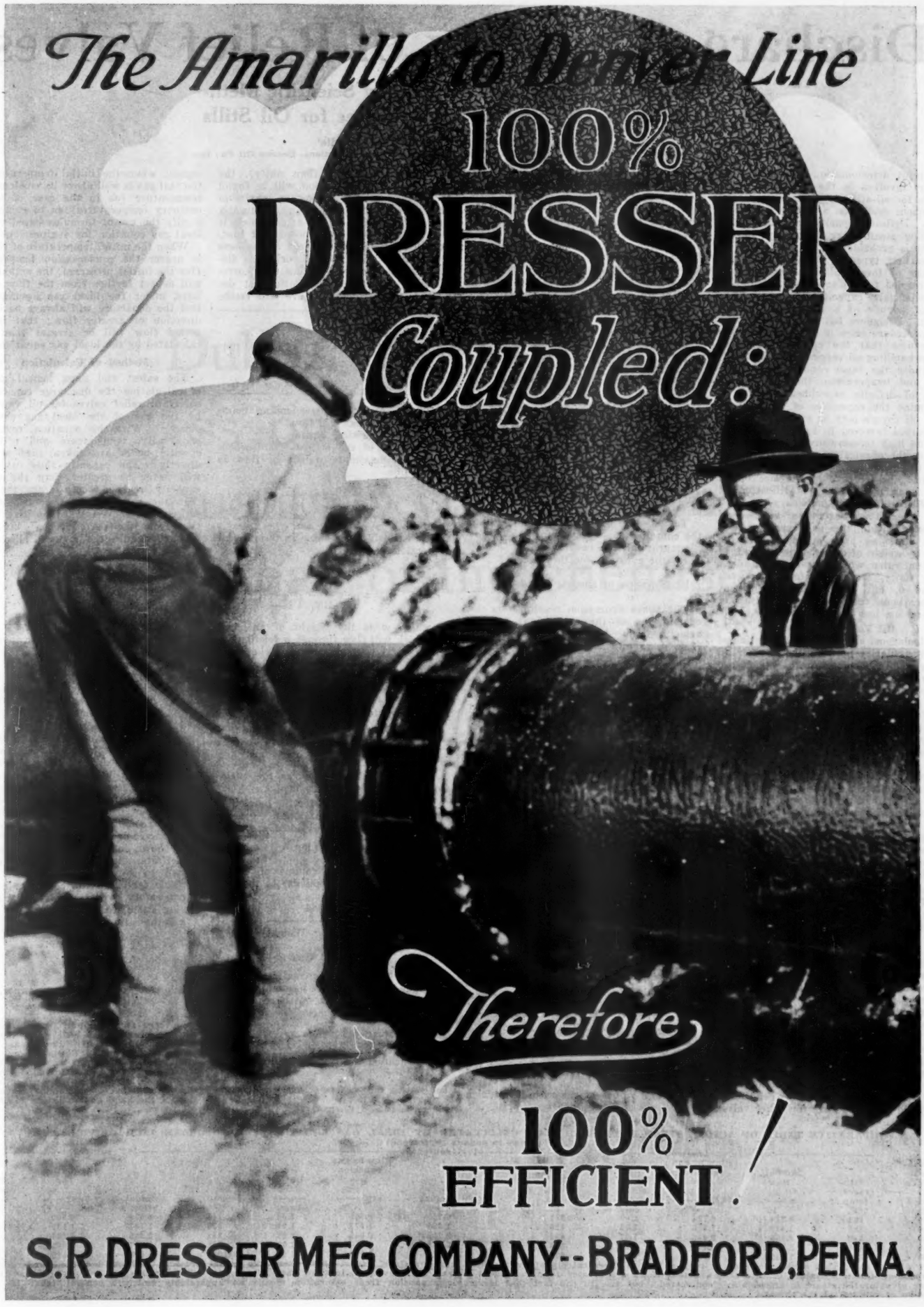
The possibilities of deeper drilling suggested in Oklahoma and the Permian Basin and California to eight and nine thousand feet assure an immense reserve of oil for years to come.

The wildcatter as the discoverer of oil reserves is being displaced by the scientist.

And at the same time research in the manufacturing end is saving more millions of barrels, creating an additional reserve and developing new uses, new products and new markets.

Research looking toward the manufacture of special products from petroleum has hardly more than begun. There is an annual consumption of $900,000,000 worth of chemicals, a large part of which are organic chemicals capable of synthesis from petroleum.

What the research of individual companies has accomplished might be increased a thousand fold if the industry had a national institute of petroleum research for the fullest co-operation in correlation of facts and exchange of scientific data and experience.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Discharge Capacity of Relief Valves

Formulas Developed to Calculate by Scientific Methods Size and Number of Safety Valves for Oil Stills

By K. S. M. Davidson[1] and Donald W. MacArdle[2]
[1]Chief Engineer, Crosby Steam Gauge & Valve Co.; [2]Manager of Sales Operations, Beacon Oil Co., Inc.

Careful determination of the various factors involved in the design of safety valves for oil stills is placing present oil equipment design on a sound theoretical basis. Definite capacities of relief valves handling steam have long been known, and it is probable that in the design of the earliest types of pressure stills, the analogy of these stills to steam boilers was carried to the extent of calculating the relief valve capacity for a given number of pounds of steam instead of oil vapor. Designers felt safe in following this procedure since it was probably safe to assume that the capacity of relief valves handling oil vapors would be greater, under the same conditions of pressure and temperature, than for steam. Lack of definite experimental work to determine the capacities of valves handling oil vapors may be explained by the difficulties involved in such work—notably the high temperatures, the indefiniteness in the physical properties of the vapors to be handled, and the extreme fire hazard. As increase in the size of oil stills took place, some modification of the older rule became necessary, to avoid what seemed an excessive number of valves. Within the past year or two some designers have assumed that the ratio by weight of oil vapor to steam that a given valve would handle, instead of being unity, was some factor between 3 and 6, but so far as the present authors know, no theoretical analysis of the problem has hitherto been attempted.

Oil Vapor and Steam

Calculations based on an assumption of direct similarity between the flow of oil vapor and that of saturated steam are uncertain. If the oil vapor is at or near its condensation temperature, comparison with steam implies comparable properties. Available data are wholly inadequate to establish any such similarity. If the oil vapor is highly superheated, direct comparison with saturated steam will give results which are too high.

The calculations given below start with the equation for the flow of an ideal gas from an orifice, test the applicability of the ideal gas assumptions to the flow of real vapors, and derive a simple direct equation by which the capacity for oil vapor of any safety valve which satisfies the conditions stated in the next paragraph may be calculated.

The calculations are applicable to any relief valve which is so designed that when the valve is blowing, the flow of vapor is substantially identical with the flow through a free-blowing orifice, and with the condition that the back pressure is less than the critical value for the relieving pressure of the valve. The latter condition will normally be met if the relieving pressure is above 15 pounds per square inch gauge, which is universally the case in modern cracking still practice; the former condition requires that—when blowing—the valve disc shall lift slightly more than enough to make the valve throat the controlling discharge orifice, thereby realizing the "full-bore" capacity of the throat under any conditions. It should be noted that for relief valves in which the flow is limited by the position of the disc—the disc being held in balance by the pressure and spring loadings—no simple analysis may be applied, since the lift at which balance will occur, and hence the discharge area of the valve, cannot be predicted for the wide variety of conditions encountered.

Adiabatic Flow

The general expression for the adiabatic flow of an ideal gas through a frictionless orifice is:

$$w = a\,p_1\sqrt{\frac{2g}{RT_1}}\left\{\frac{k}{k-1}\left[\left(\frac{p_2}{p_1}\right)^{\frac{2}{k}}-\left(\frac{p_2}{p_1}\right)^{\frac{k+1}{k}}\right]\right\}^{\frac{1}{2}} \qquad [1][1]$$

[1]See any text on thermodynamics.

where

w = weight of gas discharged in pounds per second.

a = area of the orifice in square inches.

p_1 = pressure of the gas in the container before the orifice in pounds per square inch absolute.

p_2 = pressure of the gas at the smallest area of the flowing stream (throat of the orifice).

T_1 = absolute temperature of the gas in the container.

g = gravitational constant.

R = the constant for the gas.

k = the ratio of specific heats $\frac{c_p}{c_v}$.

The above expression results from the combination of the expressions for the velocity produced by the drop in pressure from p_1 to p_2 (i.e. by the conversion of heat to kinetic energy), with the expression for the volume of the gas at the pressure p_2 which must pass the orifice. It is readily seen without reference to the expression that with a given gas under given initial pressure and temperature conditions, reduction of the value of p_2 results in greater velocity, tending to increase the weight flowing, but results at the same time in greater volume of the gas at the point of smallest area, tending

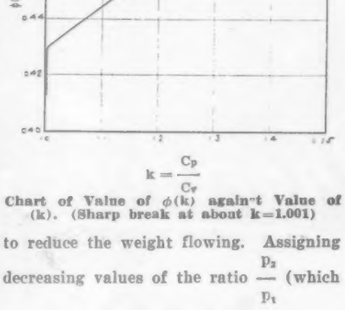

Chart of Value of $\phi(k)$ against Value of (k). (Sharp break at about k=1.001)

to reduce the weight flowing. Assigning decreasing values of the ratio $\frac{p_2}{p_1}$ (which must always be less than unity), the weight flowing per second will be found to increase until it becomes a maximum at a particular value of this ratio, usually called the critical ratio, after which it decreases. It is a well-known fact that, provided the pressure of the atmosphere or container into which the orifice is discharging is not greater than that corresponding to the critical ratio just described, the critical pressure will establish itself, and the corresponding maximum weight of gas will flow.

Critical Ratio

The value of the critical ratio which results in maximum weight of flow is found to be

$$\frac{p_2}{p_1} = \left(\frac{2}{k+1}\right)^{\frac{k}{k-1}} \qquad [2][2]$$

and substituting this value in the general expression:

$$w = a\,p_1\sqrt{\frac{2g}{RT_1}}\left\{\frac{k}{k-1}\left[\left(\frac{2}{k+1}\right)^{\frac{2}{k-1}}-\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}\right]\right\}^{\frac{1}{2}} \qquad [3]$$

in which w is the weight of an ideal gas which will flow through a frictionless orifice in 1 second, provided the back pressure on the down stream side is less than the critical pressure.

Since the factor in braces depends only on the value of k, equation [3] may be written:

$$w = a p_1\sqrt{\frac{2g}{RT_1}}\times\phi(k) \qquad [4]$$

The appended graph shows the variation of $\phi(k)$ with variation of k.

R is the gas constant for the particular gas. In English units, the general equation of state for any ideal gas is:

$$PV_m = 1544\,T \qquad [5]$$

in which V_m is the volume of a mol (molecular weight in pounds) of the gas. Therefore,

$$R = \frac{1544}{\text{Molecular Weight}} \qquad [6]$$

No Ideal Gas

Strictly speaking, no real gas is an ideal gas. However, the assumption that the flow of a real gas can be calculated by the ideal gas equation is so nearly correct when the initial temperature of the real gas is well above its condensation temperature (as in the case of air at ordinary temperatures) as to completely justify the use of formulas based on the ideal gas equation for engineering work.

When the initial temperature of the gas is nearer the condensation temperature (for the initial pressure), the actual flow will depart further from the flow calculated under the ideal gas assumptions. But the departure will always be in the direction of greater flow; that is, the actual flow will be greater than that calculated by the ideal gas equation.[3]

Method of Calculation

The safest and most logical method of calculating the discharge capacity of safety or relief valves for oil vapors is by the use of the ideal gas equation directly. With this equation, variations of density, temperature and ratio of specific heats are taken into account directly. The capacity thus calculated will never be greater than the actual capacity realized, both from the fact that the saturated oil vapors may be expected to show marked positive deviation from the perfect gas law, and further because the material discharged will normally be not a dry vapor, but a spray containing a considerable proportion of liquid oil.

To apply the ideal gas equation to an actual safety valve computation, it is only necessary to substitute the values of p_1, T_1, a, Molecular Weight (MW), and k, for the particular case. With the exception of k, these are independent variables, whose values are known or can be estimated. An exact determination of k will usually be impossible. Data on the specific heats of the heavier hydrocarbons are very meager, so that k could not usually be determined even if the complex mixture of the still charge were accurately known. However, it is shown in the next paragraphs that a definite minimum value can be assigned to k which eliminates it as a variable factor in the equation, and insures safety without unnecessarily reducing calculated capacities.

k is the ratio of specific heats,

$$k = \frac{c_p}{c_v}.$$

While for a real gas or vapor, both

(Continued on Page 385)

[2]This evaluation is made by differentiating the general expression [1] with respect to $\frac{p_2}{p_1}$, equating the first derivative to zero, and solving for $\frac{p_2}{p_1}$. Zeuner, Theorie der Turbinen, Leipzig, 1899, page 268f.

[3]For the pressures and temperatures met with in practical oil still work, the intermolecular forces in real gases cause a contraction of volume, allowing more weight of gas to pass through an orifice; that is, the real gas has a smaller volume than the ideal. The appendix to this paper includes a more detailed discussion of the application of the ideal gas equations to the flow of steam.

COMPARATIVE TABLE OF ACTUAL STEAM FLOW WITH FLOW CALCULATED BY IDEAL GAS EQUATION FOR 1 SQUARE INCH ORIFICE AREA
(Flows in pounds per second)

Initial pressure pounds per sq. inch absolute	Dry saturated: Saturated temp. °F.	Dry saturated: Actual flow $w=\frac{p_1}{70}$	Dry saturated: Flow by gas equation $w=0.389\frac{p_1}{\sqrt{T_1}}$	Dry saturated: Ratio actual / calc.	100° superheat: Total temp. °F.	100° superheat: Actual flow	100° superheat: Flow by gas equation $w=0.409\frac{p_1}{\sqrt{T_1}}$	100° superheat: Ratio actual / calc.	500° superheat: Total temp. °F.	500° superheat: Actual flow	500° superheat: Flow by gas equation $w=0.409\frac{p_1}{\sqrt{T_1}}$	500° superheat: Ratio actual / calc.
50	281	0.714	0.714	1.00	381	0.705	0.705	1.00	781	0.579	0.580	1.00
100	328	1.428	1.385	1.03	428	1.386	1.372	1.01	828	1.137	1.139	1.00
200	382	2.858	2.682	1.07	482	2.723	2.665	1.02	882	2.229	2.231	1.00
400	445	5.715	5.175	1.10	545	5.330	5.150	1.03	945	4.357	4.362	1.00
800	518	11.42	9.997	1.12	618	10.54	9.980	1.06	1018	8.600	8.510	1.01

It will be noted that actual flows agree very well with flows calculated by the ideal gas equations, except that where the initial pressure is high and the temperature low (approaching the temperature of saturation), actual flows are greater than calculated flows. This deviation, in the right direction for safety, is due not only to the fact that the volume of saturated steam is appreciably "contracted," but also to the fact that isentropic expansion from saturation means an appreciable moisture content (that is, further reduction of volume) at the throat.

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GALVESTON MEETING OF ENGINEERS PROMISES TO BE FULL OF INTEREST

By L. G. E. Bignell

The regular fall meeting of the Texas-Louisiana-Arkansas district of the Division of Development and Production Engineering of the American Petroleum Institute to be held at the Galvez Hotel, Galveston, Tex., September 5 and 6, promises to be one of the best district meetings of the year.

The program has been prepared with great care and it is intended to have the papers printed and distributed sufficiently ahead of their presentation to permit full discussion of each subject by those interested.

There is every indication that the meeting will be well attended for coming as it does at the end of a hot summer, many of the superintendents and technical men for the companies in the Texas, Louisiana and Arkansas fields plan to combine pleasure with business and will take their families with them for an outing.

In the absence of Chairman A. S. Field, in California, on his vacation, Walter H. Meier has been handling details of the papers and now that Mr. Field has returned to his office the final work of preparing these subjects for presentation will be quickly finished.

The program follows:

Morning Session, September 5, 9:30 a. m.

1. "Centrifugal versus Reciprocating Pumps for Gathering Oil," D. H. Levy, Magnolia Petroleum Co., Dallas, Tex.
2. "Problems and Progress in the Protection of Underground Pipe Lines Against Corrosion," Dr. Gordon H. Scott, American Petroleum Institute Research Associate with United States Bureau of Standards, Dallas, Tex.
3. "Metallurgy of Hard-faced Rotary Drill Bits," W. A. Wissler, research engineer, Union Carbide and Carbon Research Laboratory, Long Island City, N. Y., and C. W. Metzger, sales engineer, Haynes Stellite Co., Houston, Tex.

Afternoon Session, September 5, 1:30 p. m.

1. "Methods of Waste Water Disposal," S. W. Oberg, Humble Oil & Refining Co., Houston, Tex.
2. "Weighing and Counterbalancing Wells," W. C. Shutts, petroleum engineer, Humble Oil & Refining Co., Houston, Tex., and B. L. Moore, electrical engineer, Humble Oil & Refining Co., Houston, Tex.
3. "Proper Care of Sucker Rods," R. H. Reese, engineer, Atlantic Oil Producing Co., Dallas, Tex.

Evening Session, September 5, 8 p. m.
Main Ball Room

Meeting of district officers and all officers and members of district committees.

Morning Session, September 6, 9:30 p. m.

1. "Standardization of Electric Power Rate Structure for Drilling and Production," E. Stanley Durward, Shell Petroleum Corp., Dallas, Tex.
2. "Summary of Repressuring Prac-

(Continued on Page 360)

INTERESTING CONTESTS ARRANGED FOR THIS YEAR'S PETROLEUM SHOW

Indicative of the determination of William B. Way, manager of the International Petroleum Exposition to be held in Tulsa October 5-12, not to depend upon the successes scored in previous years to attract interest, but to make the 1929 show distinctive in the character of its program is the announcement that there will be two contests, each of which is certain to be watched closely.

One of the contests is in pipe line welding, sponsored by the American Welding Society. The other is a safety inspection contest for well pullers. Arrangements for each of these trials have been completed, according to Don J. Wallace, chairman of the Exposition safety and contests committee.

The conditions governing the welding contest follow:

1. Size of pipe to be 6-inch standard, beveled to 45 degrees with Wagner cutting machine.
2. Type of weld to be ripple, butt and rolling.
3. Pipe will be tacked for four welds on each firing line before contest starts.
4. Pipe will be rolled to conform to the speed of the fastest welder making a good weld.
5. Welding tips must be standard, as furnished with equipment.
6. The following torches, hose and regulator will be furnished: Oxweld Presto weld, Airco D. B., Meco and Victor.
7. Standard size welding rods will be furnished.

Basis of Decision

8. Each welder, on registration, will be furnished with a number which will be stamped on his weld when it is completed. The weld then will be cut out and turned over to the judges, who will determine the winners on the following basis: width of weld (should be approximately seven-eighths), proper penetration, reinforcement (should be approximately five-thirtyseconds), speed, general appearance of weld and equipment handling.
9. In case of a tie coupons will be cut from welds and tested mechanically to determine the winner.
10. Prospective contestants must register by letter to R. L. Banister, chairman welding committee, International Petroleum Exposition, Tulsa, on or before October 1.

The prospective contestants must note in their letters which of the various equipments listed above they will want to use in the contest.

The safety inspection contest for well pullers is open to all well crews. The rules governing it follow:

1. Each team shall be composed of four members, a gang pusher, a derrick man and two floormen.
2. The four members of each team shall be bonafide employes of the firm they represent.

(Continued on Page 364)

Tentative Agreement To Completely Shut In Okla. City Field

At a meeting of the representatives of the producing companies in the Oklahoma City, Okla., Field Wednesday morning, August 28, it was tentatively agreed, subject to approval of the executives of the various companies represented to shut in all production in the field 100 per cent for a period of 30 days and that all wells now drilling be shut down at a casing point above the pay formation and remain shut down until the end of the production shut-in period.

Following the near completion of the Shell Petroleum Corp.'s big well in the Oklahoma City Field, which blew in unexpectedly on Monday evening and started at the rate of 300 bbls. of oil per hour, the Shell company asked that a meeting be called for the purpose of considering the handling of production in the field, which on Tuesday of this week was in excess of the market.

A meeting was held on Tuesday afternoon in Tulsa and all the producers in the field were represented. All but one, the Sinclair Oil & Gas Co., favored prorating the field to the market, that is, to produce no more oil than the purchasing companies can handle, without storing. The Sinclair representative said that he had not had an opportunity to get in touch with the New York offices of the company and could not state what the company's policy would be. R. A. Griffith, president of the Sinclair Oil & Gas Co. was ill at his home and knew nothing of the meeting.

It was decided to adjourn to give the Sinclair representative opportunity to learn the wishes of the higher officials.

The estimated market for Oklahoma City crude at present is as follows: Empire Pipe Line Co., 20,000 bbls.; Prairie Pipe Line Co., 11,000 bbls.; and the following tank car market: Healdton Pipe Line Co. (Carter), 4,200 bbls.; Indian Territory Illuminating Oil Co. and Foster, (Empire), 2,000 bbls., same companies (Carter), 2,000 bbls.; Shell Petroleum Corp., (Shell), 5,000 bbls.

The Oklahoma Pipe Line into the field will not be completed until about October 1. With its completion and with the present pipe line and tank car capacity, 126,000 bbls. of oil could be handled as follows: Empire Pipe Line Co., 35,000 bbls.; Prairie Pipe Line Co., 24,000 bbls.; Oklahoma Pipe Line Co., 20,000 bbls.; Healdton Pipe Line Co. (tank car), 20,000 bbls.; Indian Territory Illuminating Oil Co. (tank car), 22,000 bbls.; Shell Petroleum Corp., 5,000 bbls. The Shell company is considering the construction of a pipe line into the field.

High Spots in Field News

OKLAHOMA

Deeper producing pay, flowing 500 bbls. an hour found by Sinclair well in Oklahoma City Pool.

Shell's No. 1 Hiddleston in Oklahoma City Pool blows in, flowing 300 bbls. an hour, with more than 30,000,000 feet of gas.

Production of Oklahoma City Pool increased to 47,000 bbls. a day.

KANSAS

Second producing well in State Line Pool, flowing 2,665 bbls. first 24 hours, completed by Gypsy.

ROCKY MOUNTAIN AREA

Producers & Refiners Corp. brings in 80,000,000-foot gasser on Wertz Dome, Colorado, opening new horizon.

SOUTHWEST TEXAS

New gas pool opened in Laredo district by Magnolia well, producing 30,000,000 feet of gas.

EASTERN FIELDS

Pure Oil Co. completes 200-bbl. well in Clinton sand in Muskingum County, Ohio.

GULF COAST

Three large blocks leased in Chambers and Jefferson Counties, Texas, to be subjected to geophysical exploration.

NORTH LOUISIANA-ARKANSAS

Caddo Parish proven area extended by Ray-Dawes 1,500-foot well in Dixie district.

WEST TEXAS

Cranfill & Reynolds completion in Fisher County opens possibility of addition to producing area.

TEXAS PANHANDLE

Operators in Gray County agree to shut down wells in the top of the pay in main producing areas.

CALIFORNIA

New industrial era for San Francisco Bay region opened with completion of gas line from Kettleman Hills.

A.P.I. WEEKLY REFINERY STATISTICS

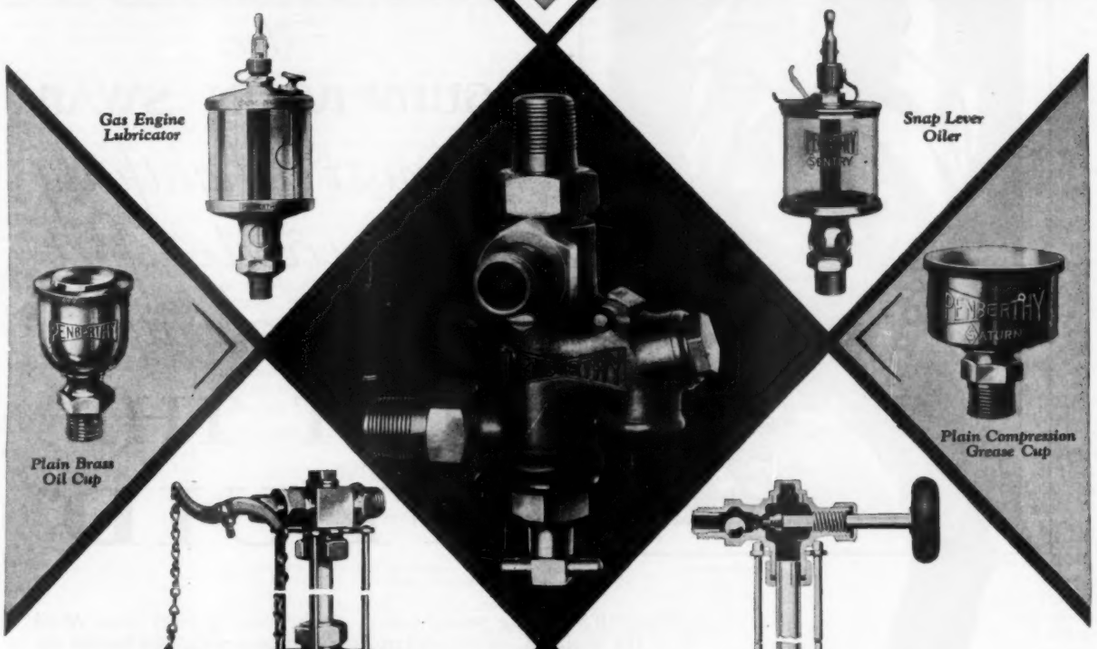
NEW YORK, Aug. 27.—The weekly report made to the American Petroleum Institute on refinery statistics—crude runs to stills, gasoline stocks and gas and fuel oil stocks—for the week ending August 24 follows:

	(1)	(2)	(3)	(4)
East Coast	100.0	3,563,700	4,341,000	8,449,000
Appalachian	86.8	516,900	911,000	777,000
Indiana, Illinois, Kentucky	98.7	2,167,500	4,983,000	3,420,000
Oklahoma, Kansas, Missouri	79.3	1,868,800	2,582,000	4,590,000
Texas	88.8	3,956,000	4,104,000	12,766,000
Louisiana and Arkansas	94.9	1,287,100	1,721,000	5,383,000
Rocky Mountains	93.4	537,100	1,789,000	933,000
California	98.7	5,068,000	11,966,000	106,983,000
Total United States	93.5	18,965,100	32,397,000	143,301,000
Texas Gulf Coast	98.7	3,042,400	3,456,000	9,699,000
Louisiana Gulf Coast	100.0	894,800	1,459,000	4,546,000

(1) Per cent refinery capacity represented. (2) Crude runs to stills. (3) Gasoline stocks. (4) Gas and fuel oil stocks.

PENBERTHY PRODUCTS

PREDOMINATE



Gas Engine Lubricator

Snap Lever Oiler

Plain Brass Oil Cup

Plain Compression Grease Cup

Navy Type Liquid Level Gauge

Safeguard Automatic Liquid Level Gauge

Screw Plunger Grease Cup

Spring Compression Grease Cup

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CANADIAN PLANT WINDSOR, ONT.

HIS HIGHNESS THE REERSEET of SEDAN says that in America The GUIBERSON SWAB is most delightfully fortunate if it can always "GET THE FLUID"

NECTAR DISTILLATA

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THERE'S nothing wrong with His Highness, somebody just needs to wise him up a little. He probably thinks that "swab" is the nickname for a young "stoolpigeon." The nearest thing he ever saw to a gushing oil well was a fizz bottle, going at full tilt. He knows that he uses some form of oil in his motor vehicle, [oh, yes, they have them in Sedan] but he calls it "petrol." The only other form of oil he ever knew was "castor." A jolly old booger, but misinformed.

Somebody ought to take His Highness to a real, live oil well and let him see the Guiberson Swab really "get the fluid." If His Highness ever rammed his hand into a small-mouthed jar to get a cherry or a pickle, and then tried to draw it out, he'll understand why the Guiberson Swab brings up every ounce of oil it starts out with. The heavier the column of fluid, the tighter the flexible cups press against the casing wall, completely sealing up the load. Guide wires steer cup rims safely past all wrinkles and projections. Cup rubbers are made from a slow-deteriorating rubber composition, which runs for weeks in high gravity oil without damaging wear.

A Guiberson Swab, to show to His Highness, won't be hard to find, for they are doing most of the world's swabbing today.

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GUIBERSON
BETTER BE SAFE THAN SORRY

Oklahoma City Well Makes 8,662 Bbls.

Joe Cromwell, Wirt Franklin and Others Extend Field Northerly. Brings Pool's Production to 41,513 Bbls.

By W. A. Spinney
Staff Correspondent, Oklahoma Fields

Joe Cromwell, the Wirt Franklin Oil Corp. and others extended the Oklahoma City Field northerly with a well that made 8,662 bbls. the first 23¾ hours. The test was No. 1 Trosper Park, C SE SE NW Section 13-11-3w, about a mile and an eighth north and a little west of the discovery well in the field. Seven-inch casing was set at 6,202 feet and the well was drilled to 6,504 feet. It was gauged from 7:15 a.m. on Sunday to 7 a.m. on Monday, and in the next hour made 350 bbls. and was making that quantity per hour when the report was made late Monday morning. The well made about 26 bbls. of water in the first 24 hours, but this may have been rotary water and mud. The Empire Pipe Line Co. is running the oil.

The new well extends production about a half mile northerly, proving up a considerable number of locations between it and other producing wells. This well brought the production of the field on Monday morning's gauge to 41,513 bbls. from 12 producing wells, one well being off production.

The gauge showed the following results:

	Bbls.
Cromwell, Wirt Franklin and others' No. 1 Trosper Park	8,662
Coline's No. 1 Olds	4,419
I.T.I.O.'s No. 1 Button	4,648
I.T.I.O.'s No. 1 Henning	1,614
I.T.I.O.'s No. 1 Johnson	3,244
I.T.I.O.'s No. 1 fee	1,296
I.T.I.O.'s No. 1 S. Bodine	1,059
I.T.I.O.'s No. 1 A. Bodine	3,250
Mid-Kansas' No. 1 Fortson	3,680
Mid-Kansas' No. 2 Fortson	2,216
Prairie's No. 1 Hiddleston	3,990
Shell's No. 1 Petty	Off
Sinclair's No. 1 Stamper	3,435
Total	41,513

The first well in the Oklahoma City Field to get a hole full of water was the Shell Petroleum Corp.'s No. 2 Petty, in the SW cor. NE Section 30-11-2w, Oklahoma County. The well has been making some oil and has made as high as 600 bbls. a day. The first water was encountered at 6,555 feet, and at 6,578 feet the hole filled with water. Drilling was continued until the test reached 6,591 feet where it is shut down. It is the north offset to the Sinclair Oil & Gas Co. and Amerada Petroleum Corp.'s No. 1 Kinter, one of the gasoline wells in the field, that was shut in by order of the Oklahoma Corporation Commission and a quarter of a mile from the Sinclair Oil & Gas Co.'s No. 1 Stamper, which is making large quantities of oil and water and is the deepest producing well in the field at the present time.

Seminole Field

With the addition of six new producing wells the daily average production of the Little River Pool is 2,000 bbls. less than last week. Most of the new shallow sand wells have been light producers. The largest well completed in the past week was the Shell Petroleum Corp.'s No. 2 Hotulke, SW cor. NE NW Section 23-7-6, Seminole County. It made 589 bbls. from the Gilcrease sand at 3,140 feet while the second day's gauge was 485 bbls. In the southeast extension of the Little River Pool there are 18 producing wells with a daily average production of 21,360 bbls. for the last week. The only test completed in that area last week was the Prairie Oil & Gas Co.'s No. 2 Thomas, in the SE cor. NW Section 5-7-7, which had the Wilcox sand at 4,211-24 feet and after a shot made 2,200 bbls. One new well was added to the Maud Pool which increased the daily average production about 300 bbls. daily. The new well is the Wilcox Oil & Gas Co.'s No. 6 Smith, NE cor. SE Section 8-8-5, Seminole County. It had Misener sand at 4,052-76 feet, while it was drilled to a total depth of 4,095 feet in Hunton lime. The initial production was 947 bbls. Mission Pool continues to decline. There were no new completions in the past week. North of the Earlsboro Townsite Empire Oil & Refining Co. and Amerada Petroleum Corp.'s No. 1 Henry, SW cor. NE NW, Section 8-9-5 Seminole County, made 2,215 bbls. from Wilcox sand at 4,360-80 feet. This well and the new producers in Section 18-9-6 account for the 4,000-bbl. increase in the Earlsboro Pool. The new extension to the Earlsboro Pool in Section 18-9-6 has 14 producing wells which made 34,995 bbls. on the gauge of August 23. The Prairie Oil & Gas Co.'s No. 1 Calkins, in NW cor. SW Section 17-9-6, has increased its flow to 6,480 bbls. and the same company's No. 2 Raitman, NE SE NW Section 18-9-6, made 4,520 bbls. from the Wilcox sand at 4,214-28 feet. Magnolia Petroleum Corp.'s No. 5 A. Anderson, in the SE cor. NE Section 18-9-6, found the Wilcox sand at 4,245-60 feet where it made 500 bbls. and sanded up. It is being cleaned out and will be put back on production later.

The St. Louis Pool shows a small decline on the gauges for the past week. It made 69,970 bbls. from 410 wells. The new production is just about enough to offset the decline of the old.

Asher Looms Again

The Asher Pool is again in the limelight with a new well that is as big as any of the previous wells in the pool. It is the Prairie Oil & Gas Co. and Tom Slick Oil Co.'s No. 6 Laster, C NE SW NE Section 19-6-4, Pottawatomie County. It flowed 5,495 bbls. on the gauge of August 23. The Viola lime in this well was found at 3,625-82 feet. It flowed as high as 360 bbls. an hour and it was necessary to pinch the well in on account of the lack of tankage on the lease. It appears that the western part of the pool will be more productive than the east side as the Simms Oil Co.'s No. 4 Laster came in a few weeks ago making 3,500 bbls. daily. The wells on the townsite are mostly shut down due to the shortage of water for drilling purposes. The pool gauged 14,343 bbls. on August 23 which is a new peak in production for that pool.

Sasakwa Pool is still declining. It made 6 397 bbls. on August 23 from 7 producing wells. The drilling tests in the area are getting to interesting depths and in a few weeks some are expected to reach the producing level.

Carter County

Ven Mex Oil Co. has the rig up for No. 3 Dixon, NE cor. SE NW, Section 30-1s-3w. Magnolia Petroleum Co. has built the rig for No. 2 Hightower, NW cor. SW NE, Section 30-1s-3w. No. 6 Hardin, NW cor. SW SE, Section 18-1s-3w, is dry and abandoned at 4,400 feet.

Comanche County

Harry Muse and others' No. 1 Hawk, NW cor. SW SW, Section 4-1-9w, has been abandoned at 2,503 feet.

Creek County

Atlantic Oil Producing Co. is erecting the rig for No. 1 C. Gooden, NE cor. SE, Section 15-14-10. No. 3 J. Bear, NE cor. SE NW, Section 16-14-10, is cleaning out at 3,239 feet to deepen. Tidal Oil Co.'s No. 2 Keys, SW cor. NE NW Section 28-17-7, is drilling at 960 feet. Magnolia Petroleum Co.'s No. 8 Mussellem, NE cor. NW SE, Section 8-18-7, has drilled deeper to 2,573 feet and is setting 5-inch casing there.

Pioneer Oil Co.'s No. 1 Williams, SE cor. SW, Section 26-14-9, has been completed for 12 bbls. in sand 2,960-86 feet. Fuhrman Petroleum Co.'s No. 1 Cappeau, SE cor. SW NW Section 6-14-10, is dry and abandoned at 3,446 feet. W. H. Elson and others' No. 1 McKee, SW cor. Section 6-14-10, has been abandoned at 3,455 feet. Carter Oil Co.'s No. 7 B. Durant, SE cor. SW NE, Section 18-16-9, has been abandoned at 3,078 feet. Silurian Oil Co.'s No. 28 W. Starr, NE cor. SE NE NE, Section 17-18-7, made a 50-bbl. well in sandy lime 2,492-2,546 feet. Flynn, Morgan and others' No. 1 Moore, SW cor. SE SE Section 3-18-9, is dry and abandoned at 2,994 feet. Superior Oil Corp.'s No. 1 Holmes, SW cor. NE SE Section 17-19-9, has been completed for 30 bbls. in sand 2-247-64 feet. William Sherry and others' No. 1 Bartlett, SW cor. NE NE, Section 28-19-9, is dry and abandoned at 2,785 feet.

Garvin County

Magnolia Petroleum Co.'s No. 1-B T. Parnell, NE cor. Section 16-1-3w, is a dry hole at 1,598 feet.

Grady County

Meridian Gas Co.'s No. 3 Short, CWL SW SE Section 25-4-8w, has been completed for 10,000,000 feet of gas in sand 2,042-2,171 feet. Ray Oil Co.'s No. 1 Grady, NW cor. Section 20-5-8w, has been abandoned at 3,363 feet.

Hughes County

Amerada Petroleum Corp. made location for No. 1 Ott, SE cor. SW, Section 15-5-11. Fuhrman Petroleum Co.'s No. 2 R. Buck, C SW SW, Section 21-9-10, is preparing to deepen from 2,062 feet. Gypsy Oil Co. and others' No. 1-A J. Long, NW cor. SE Section 14-8-9, is dry and abandoned at 3,535 feet. McGee Brothers' No. 1 Smith, SE cor. SW, Section 25-8-11, has been abandoned at 3,836 feet. Fuhrman Petroleum Co.'s No. 3 R. Buck, CWL SE SW, Section 21-9-10, made 17,000,000 feet of gas in sand 2,780-95 feet.

Kay County

Comar Oil Co.'s No. 3-W Beverlin, NE cor. NW SE NW, Section 34-25-1w Tonkawa Pool, has been abandoned at 4,648 feet.

Logan County

Healdton Oil & Gas Co.'s No. 1 Gragg, SW cor. Section 29-18-4w, has been completed for 45 bbls. at a total depth of 6,968 feet, production coming from Hunton line, 6,636-50 feet.

McIntosh County

Beard & Hammond, abandoned No. 6 S. Ireland, NE cor. SE, Section 27-11-15, at 1,835 feet.

Lincoln County

Magnolia Petroleum Co. made location for No. 1 Freeman, SW cor. SE SE, Section 8-14-4. Location was also made for No. 1 Waggoner, NE cor. NW NE, Sec-

(Continued on Page 66)

WILDCAT OPERATIONS IN OKLAHOMA

(Descriptions are East and North unless marked otherwise)

NORTHERN OKLAHOMA

ALFALFA COUNTY

Company, farm and location—	Remarks:
Smith Bros.' No. 1 Forbes, SE cor. NW NW Sec. 12-27-11w	Shut down 800 ft.
Washoma Oil Co.'s No. 1 Acre, SW cor. NE Sec. 14-24-11w	Rig.

BECKHAM COUNTY

Kay and others' No. 1 Martin, C E half E half NW Sec. 32-8-24w	Drlg. 520 ft.
Producers Exploration Co.'s No. 1 Seidell, SE cor. SW SW Sec. 17-9-22w	Shut down 2,402 ft.
Carson and others' No. 1 Danby, SW cor. SE NE Sec. 20-8-22w	Shut down 1,547 ft.

BLAINE COUNTY

Lowen and others' No. 1 Unknown, NW cor. SW NW Sec. 27-16-11w	Spudded and shut down; renewing leases.
Washoma Oil Co. and others' No. 1 Phillips, C NW SW Sec. 13-19-10w	Drlg. 2,945 ft.

CADDO COUNTY

Abernathy & Brown's No. 1 Horton, SE cor. Sec. 8-6-13w	Shut down 535 ft.
W. J. Hartley's No. 1 Galbreath, SE cor. NW SE Sec. 29-5-12w	Shut down 3,394 ft.

CLEVELAND COUNTY

Daniels & LeWright's No. 1 Vandever, C SW Sec. 15-7-1w	Shut down 3,130 ft.
Phillips Pet. and T. B. Slick's No. 1 Sudick, NE cor. NE Sec. 8-10-2w	Drlg. 7,049 ft.; water.

COAL COUNTY

W. E. McGraw's No. 1 King, C SW NE Sec. 11-1-8e	Fishing 1,585 ft.
J. S. Cosden's No. 1 Richardson, NW cor. NE NE Sec. 6-2-8	Abandoned 2,648 ft.
McGinley & Sigler's No. 1 Willsey, NW cor. SE SE Sec. 7-2-8	Drlg. 2,520 ft.
E. W. Whitney's No. 1 Brown, C SE NE Sec. 10-2-8	Shut down 202 ft.

COMANCHE COUNTY

Muse et al's No. 1 Cross, NW SW SW Sec. 4-1-9w	Drlg. 2,216 ft.
Green and others' No. 1 Wilson, C NE SW Sec. 14-1-12w	Shut down 4,055 ft.

CREEK COUNTY

Shaffer et al's No. 1 Moore, SW SE SE Sec. 3-18-9	Wilcox 2,990-3,000 ft.; water; shut down.

CUSTER COUNTY

W. E. Witt's No. 1 Wellman, C SE Sec. 1-14-14w	Rig and tools.

GARFIELD COUNTY

E. L. Love and others' No. 1 White, SE cor. NW Sec. 9-24-6w	Shut down 5,566 ft.

GRADY COUNTY

J. V. Bailey's No. 1 Hubbard, C NE NW Sec. 1-10-6w	Spudded and shut down.
J. M. Henry and others' No. 1 Abraham, SE cor. NW Sec. 4-5-8w	Rig.

GRANT COUNTY

Bailey's No. 1 Stover, C SW SE Sec. 30-27-5w	Rig on ground.
Baucher et al's No. 1 Deadman, SW SE Sec. 12-28-4w	Drlg. 750 ft.
Cowden and others' No. 2 Vollmer, CEL NE SW Sec. 22-25-4w	Shut down 5,640 ft.

GARVIN COUNTY

Gardner Pet. Co.'s No. 1 Halverson, SW cor. NE Sec. 8-4-2	Shut down 4,355 ft.

GREER COUNTY

Helmerick & Payne's No. 1 Henck, NW cor. Sec. 23-6-24w	Shut down 485 ft.
I. T. I. O. and others' No. 1 fee, C SW NE Sec. 17-6-24w	Underreaming casing 1,903 ft.
S. M. Stauffer's No. 1 Castleman, SW NE Sec. 8-4-26w	Shut down 625 ft.

(Continued on Page 369)

Extend State Line Pool in Sumner

West Offset to Discovery Well Starts at 2,665 Bbls. but South Offset, in Oklahoma, Gets Water in the Wilcox

By W. A. Spinney
Staff Correspondent, Kansas Fields

The successful completion of the second producing well in the State Line Pool is an important event in the oil news in Kansas this week. The test was drilled by the Gypsy Oil Co. and is the west offset to the discovery well by the same company. The new well is No. 1 Enderud, in Section 16-35-3w, Sumner County. It topped the Wilcox sand at 4,763-64 feet, where the test started flowing at the rate of 130 bbls. an hour and made 2,665 bbls. the first 24 hours. The first 8 hours' gauges were as follows: From 11 to 12 o'clock, 140 bbls.; from 12 to 1, 136 bbls.; 1 to 2, 134 bbls.; 2 to 3, 132 bbls.; 3 to 4, 134 bbls.; 4 to 5, 122 bbls.; 5 to 6, 132 bbls.; from 6 to 7, 120 bbls. The tools were still in the hole at the time the gauges were taken. The oil tests 48.5 gravity. The discovery well made 610 bbls. on the gauge of August 23, the day the second well was completed. The discovery was completed April 15 with an initial production of 2,200 bbls. Since its completion it has made over 120,000 bbls. of 48 gravity oil. The south offset in Grant County, Oklahoma, found water in the Wilcox sand at a total depth of 4,868 feet. It is being plugged back to test the Simpson at 4,845-53 feet and will be given a shot and a production test. The other offset is being drilled by the Amerada Petroleum Corp. A diagonal offset is also in Grant County, Oklahoma, and it is drilling at 4,525 feet.

The high-gravity Rice County well that has been shut in for a pipe line connection is expected to be opened up in a few days. The test was originally drilled by Hilligoss & Steinbuchel, NE cor. SW Section 21-20-10w. It has been flowing about 8 bbls. daily while waiting for a pipe line connection. The test was purchased by the Tom Slick Oil Co. along with 2,000 acres of leases around the well. No new locations will be made until operations are renewed and a test made of the well. The oil tests 51.5 degrees gravity and is the highest gravity crude yet found in the State. The Vickers Petroleum Co. has laid a pipe line to the well and will run the oil to its refinery near Wichita.

In the Samuels Pool

The Samuels Pool in the northern part of Sedgwick County, will be less puzzling to the oil operators in that area when the tests now drilling reach the chat horizon. The discovery well drilled by the Barnsdall Oil Co.. No. 1 Samuels, NE cor. NW Section 24-25-1, has been plugged back from the lime to the chat at 3,060 feet, and is being pumped to exhaust the water from the chat horizon where it first found its oil production before being drilled deeper. The same company is drilling No. 1 Parks in the SW cor. SE Section 31-25-1, a diagonal offset to the discovery. It has been rigging up standard tools and will be drilling ahead in a few days. The Producers & Refiners Corp.'s No. 1 Kuske, also offsetting the discovery, has been making 180 bbls. a day from the chat. Same company's No. 2 Kuske is drilling at 2,050 feet.

White Eagle Oil & Refining Co. and others have announced a new wildcat location in Marion County on the Ucker farm in Section 24-17-2. It will be a community test with the following companies pooling their acreage: White Eagle Oil & Refining Co., Anderson & Anderson, Sherman & Reynolds, Prairie Oil & Gas Co., Carter Oil Co., The Texas Company, Phillips Petroleum Co.

Deep Failure in Rice County

Prairie Oil & Gas Co.'s No. 3 Welch "B," NW cor. NE SW Section 35-20-6w, Rice County, has found water at 3,804 feet and will be abandoned. This test was an old well that was deepened in hopes of locating a new producing horizon in the old pool that has been producing for the last six years.

Several Harvey County tests have been abandoned after finding water. Shell Petroleum Corp.'s No. 1 Stauffer, C NW Section 11-23-2w, found water at 3,052 feet and was drilled to a total depth of 3,075 feet in lime and abandoned. McPherson Oil & Gas Co.'s No. 1 Ruth, SW cor. NE NW Section 14-23-2w, Harvey County, had water at 3,438-42 feet and will be abandoned at 3,457 feet.

A Reno County wildcat shows oil and gas in an unidentified horizon. The test was started by the Austin Oil Corp. but is now being operated by the United Petroleum Corp. and Milmac Oil Co., which have over 1,000 acres of leases surrounding the test. It is No. 1 Stucky, SW cor. NW Section 17-26-5w. The showing of oil was found at 3,619-20 feet and the gas showing at 3,621 feet but on account of a caving hole and engine trouble a test could not be made. Casing will be landed before the well is drilled deeper.

Western Butler Is Busy

The western part of Butler County is very active, opened by the Laroi Oil & Gas Co.'s No. 1 Glancy, which is producing from chat and is averaging 110 bbls. daily. It is located in the SW cor. of Section 10-26-3e and is the most westerly producer in the county. With the three offsets drilling new production is expected in a short time. Arkansas Natural Gas Co.'s No. 1 Campbell, SE cor. Section 9-26-3, was drilling at 1,950 feet. Lario Oil & Gas Co.'s No. 1 Daum, NW cor. Section 15-26-3, was drilling at 2,200 feet. Sinclair Oil & Gas Co.'s No. 1 Johnson, NE cor. Section 16-26-3 Butler County, was drilling at 1,300 feet. The new well of the Walton Co., the No. 1 Thompson, in Section 2-24-3 Butler County, is pumping about 150 bbls. a day from the chat at 2,530-53 feet.

New locations have been staked in Barton and Pratt Counties. Allison-Fitzwilliam Petroleum Corp.'s No. 1 in the NE cor. Section 19-16-12w, is in the northeastern part of the county and is 3 miles south of the new producer recently completed by the Prairie Oil & Gas Co., the No. 1 Sellans in Russell County. The block consists of about 4,500 acres. The other location has been made by the same company in the NE cor. SE Section 7-16-14w Pratt County, and is on a block of 7,000 acres which have been core drilled and it is believed to be on a good structure.

Greenwood Developments

Empire Oil & Refining Co.'s No. 3 A. Norton, SE cor. NW NE Section 22-22-12 Greenwood County, which is one location south of the discovery well, has 900 feet of oil in the hole from the Bartlesville sand at 1,717-36 feet; it will be put to pumping without a shot. In the south end of the Seeley Pool the Phillips Petroleum Co. recently completed two wells on the Beal farm in Section 28-23-11, which gauged 1,225 bbls. on August 24. The Empire Oil & Refining Co.'s No. 1 Murphy, in the NW Section 32-21-11, Lyon County, had a small show of oil at 1,956-70 feet but is drilling ahead.

The Greenwich Townsite has reported a failure in chat and the test will be deepened to the Simpson lime. Ramsey and others' No. 2 in Section 15-26-2 is rigging up to deepen at 2,965 feet. This will be the first test to the Simpson line in this area. The discovery well of the Shell Petroleum Corp. was originally started to test the Simpson horizon but found its production in chat. It gauged 955 bbls. on August 24 and is still the largest townsite producer. The same company's No. 1 B. Lygrisse, just north of the townsite in SW cor. Section 14-26-2, had chat at 2,902-05 feet, with a hole full of oil, is still shut down until the 6-inch casing has been landed. Same company's No. 1 Brown is rigging up standard tools at a total depth of 2,935 feet. Same company's No. 1 Fisher was getting ready to set 6-inch casing at 2,929 feet. These tests are all in the townsite of Greenwich.

The Margaret Gay Oil Co.'s No. 1 Grove in the NW NE NW Section 29-23-1w. Harvey County, will resume drilling after being shut down at 3,012 feet. It is expected to test out the 3,500-foot horizon. It is shut down in the top of the lime where it had a small showing of oil.

New Locations in Stevens

Two new locations have been staked in Stevens County, which has several completed gas wells which are now shut in. McKenna and others announce a new location in the C NW Section 29-33-36w. The other location has been made by Trees Oil Co. in the C SW Section 3-35-38w. the gas sand in this area is encountered at 3,500 feet.

Four miles south of Wichita in the Robbins Pool, Sedgwick County, producing wells are being found on both sides of the highway. The White Eagle Oil & Refining Co.'s No. 2 Robbins, in the SE cor. Section 20-18-1e. had the top of the pay horizon at 3,099-3,105 feet, where the hole filled up and flowed in 2 hours. The well was swabbed for an hour and a half and it made 45 bbls. of oil. It is the sixth producing well in the pool and it appears to be one of the best. The discovery well drilled by Dickey & Shell Petroleum Corp. is making around 260 bbls. daily. The same company's north offset to the discovery well is making 70 bbls. daily. The Texas Company's No. 1 Blood is expected to be a 200-bbl. producer after the tubing and rods have been installed. The Derby Oil Co.'s No. 1 Blood in Section 28-28-1e has landed casing at 2,771 feet. Milmac Oil Co. and Red Bank Oil Co.'s No. 1 Stucky, Section 22-28-1 Sedgwick County, was drilling in lime at 3,180 feet, it is believed that this test has missed the chat. It will be drilled to the Simpson formation.

McPherson County wildcat test finds shallow gas and is attracting considerable attention to that area. The Mid-Kansas Oil & Gas Co.'s No. 1 Kuns, C SE SW Section 11-20-5w, McPherson County, which is half way between the Rice County Field and the McPherson County gas field, had a good show of gas at 1,052-62 feet, the gas was found in a brown sand and it was drilling to the deeper horizons at 1,150 feet.

Completion in Davis Pool

The Tidal Oil Co. is completing a good well in the Davis Pool in Marion County. It is located in the southeast extension to the pool in the NE cor. SW SW

(Continued on Page 68)

WILDCAT OPERATIONS IN KANSAS

(Descriptions are East unless otherwise marked)

BARBER COUNTY

Company, farm and location—	Remarks:
Rolland & Skelly Oil Co.'s No. 1 Pickens, C NE NW NE Sec. 27-30-14w	Shut down 4,734 ft.; show oil.
Skelly Oil Co.'s No. 1 Temple Ranch, Sec. 13-34-15w	Drlg. 2,960 ft.
Barbara Oil Co.'s No. 1 Angel, NW cor. NE Sec. 14-33-13w	Drlg. 4,637 ft.
Robertson et al's No. 1 Powell, SE cor. SE Sec. 11-32-10w	Drlg. 2,100 ft.
Allison & Fitzwilliams' No. 1 Morrisse, C NW SE SE Sec. 9-30-12w	Drlg. 3,980 ft.

BARTON COUNTY

Slick et al's No. 1 Sweeney, SW NE Sec. 23-17-11w	Rig on ground.
Everett & Wiley's No. 1 Ward, NW cor. SW Sec. 12-20-13w	Shut down 3,948 ft.

BUTLER COUNTY

Travis et al's No. 1 Harrison, SE cor. Sec. 21-25-3	Drlg. 1,750 ft.
Milmac Oil Co.'s No. 1 Clearwater, SW cor. Sec. 33-25-3.	Drlg. 1,000 ft.
Lario Oil & Gas' No. 1 Gordon, NW cor. Sec. 15-26-3	Drlg. 2,105 ft.
Sinclair Oil & Gas' No. 1 Johnson, NE cor. Sec. 16-26-3.	Drlg. 1,279 ft.
Empire O. & R. Co.'s No. 1 Parks, NE NW Sec. 36-29-4	Drlg. 2,880 ft.
Arkansas Fuel Oil Co.'s No. 1 Campbell, SE cor. Sec. 9-26-3	Drlg. 1,890 ft.
White Eagle's No. 1 Bachelder, SW cor. Sec. 17-25-3e	Drlg. 2,790 ft.
Crawford et al's No. 1 Thompson, NW cor. SW Sec. 2-24-3e	Drlg. 2,530-34 ft.; 30 bbls., completed.

CLAY COUNTY

Derby Oil Co.'s No. 1 Meimueller C NW SW Sec. 9-10-3e.	Drlg. 565 ft.

COWLEY COUNTY

Landon & Slick's No. 1 Daniels, NE SE Sec. 6-30-5e	Drlg. 2,880 ft.
J. B. Markley's No. 1 Tatum, SE cor. SW Sec. 11-31-6	Shut down 500 ft.

DICKINSON COUNTY

Hiatt & Durham's No. 1 Wendt, NW cor. Sec. 17-16-2	Rig.
Cress & Hawky's No. 1 Menli, NE cor. Sec. 12-15-2	Rig.
Prairie Oil & Gas Co.'s No. 1 Morgan, NW cor. Sec. 26-16-3e	Drlg. 2,930 ft.
Milmac's No. 1 Biehler, SW NE Sec. 28-16-4e	Drlg. 3,001 ft.

ELLIS COUNTY

Streeter & Stearns' No. 1 Leiker, SW NE Sec. 26-13-20w.	Rig.
Mid-West Exploration's No. 36 Berens, C SE NW Sec. 12-13-16w	Drlg. 450 ft.
Phillips Pet. Co.'s No. 1 Harder, NE SW Sec. 8-12-17w.	Drlg. 3,983 ft.
Byrens et al's No. 1 Fisher, NW SE Sec. 4-11-20w	Drlg. 450 ft.
Rush Oil Co.'s No. 1 Gatewood, NW cor. NW Sec. 4-15-20w	Fishing 2,555 ft.
Finney & Weiner's No. 1 Freeman, SE cor. SW Sec. 24-15-20w	Spudded and shut down.
Phillips Pet. Co.'s No. 1 Schneider, NW cor. Sec. 20-12-17w	Drlg. 3,429-39 ft.; 108 bbls. in 9 hrs.; completed.
Burger et al's No. 1 Hadley, SW cor. SW NW Sec. 20-11-17w	Drlg. 3,408-40 ft.; swabbed 80 bbls. 24 hrs.

ELLSWORTH COUNTY

Tatlock et al's No. 1 Sackem, C SW SE Sec. 25-17-9w.	Drlg. 560 ft.
The Texas Company's No. 1 Sherman, NE SW Sec. 16-17-8w	Drlg. 2,395 ft.

GRAHAM COUNTY

Gulf Coast Oil Co.'s No. 1 Johnson, C S half Sec. 27-8-25w	Drlg. 4,000 ft.

(Continued on Page 370)

A hundred words might be inscribed on the face of a piece of silverware and yet not say as much as the simple word "Sterling".

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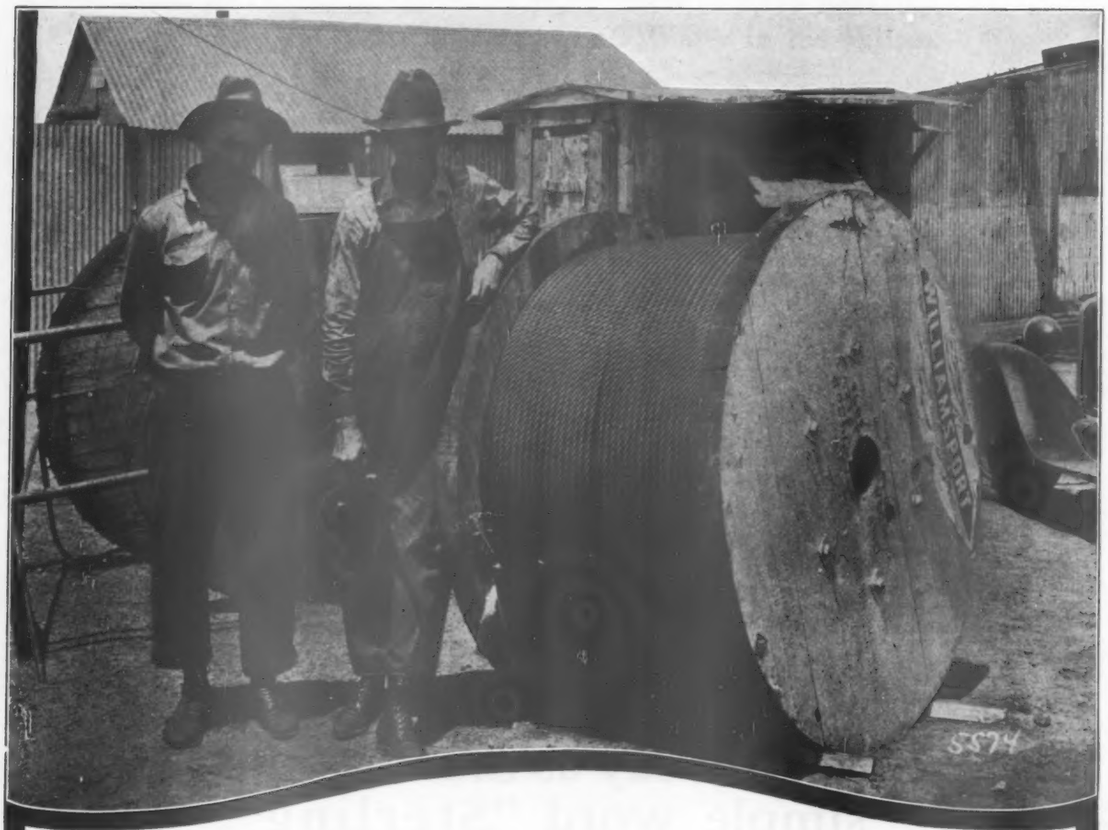

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Big Well Extends Dixie Pay in Caddo

Ray-Dawes Drilling Co. Gets 1,500-Bbl. Well Three-Quarters of a Mile Ahead of Production. Twenty-eight Completions

By D. H. Bancroft
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Aug. 24.—The proven area of the Dixie district of Caddo Parish was extended three-quarters of a mile northeast of nearest production this week when Ray-Dawes Drilling Co.'s No. 2 Hunter, SW cor. Section 9-19-14, came in from 13 feet of sand, total depth 2,424 feet, flowing 1,500 bbls. daily of pipe line oil.

It was the second extension in three weeks, D. C. R. Oil Co. having completed No. 1 Oden in Section 20-19-14, a like distance south of production, as a small pumper from the same total depth. Four days after completion the Ray-Dawes well was flowing 1,110 bbls., the rate of decline being about the same as in other Dixie wells. The other feature wells of the week, one a completion, were in Red River and DeSoto Parishes. Eylers Oil Co.'s No. 1 Chaffraix, Section 30-12-10, Red River, in the southeast corner and on the edge of production in the Bull Bayou district, was finished as a gasser gauging 8,460,770 feet at 485 pounds rock pressure, total depth 2,660 feet. It is surrounded by deeper dry holes and one or two gas wells.

The company has made location for its second well a half mile south of No. 1 which, if successful, will be followed by a series of others. The third well, not a completion, is Fair and others' No. 1 Hamilton in Section 1-12-13, DeSoto Parish. When it was time to drill in it was found the hole had caved and on drilling out the bridge it started making 3,000,000 feet of gas from 2,790 feet, total depth, and was shut in for four hours. Opened again and blown for a like period it began showing 45 gravity oil when the casing seat gave way and water drowned it out. Casing has been recemented and another test is scheduled for the coming week. The oil is coming from a formation just above the Glen Rose of the Trinity series, the top of which group was found at 2,569 feet, approximately 1,200 feet "high" on structure. Benedum & Trees Oil Co.'s No. 2 State, Section 22-14-12, DeSoto, also topped the Trinity away high, but was abandoned this week as a salt water hole, total depth 3,609 feet. It found some gas at 2,617 feet. The company is moving its rig to Paxton, Shelby County, Texas, where it has a 12,000-acre block on which it is obligated to drill two wells, the first to start immediately.

Twenty-eight Completions

The North Louisiana-Arkansas division had an unusually large crop of completions, eight producers, all but one of which were in Caddo Parish, Louisiana, making a total of 2,000 bbls. initial; 9 gassers with an initial open flow of 26,180,000 feet and 11 failures. Four of the producers were in the Dixie district of Caddo and besides the Ray-Dawes extension were Gulf Refining Co.'s No. 2 Hunter, NE SW Section 17-19-14, 40 bbls. at 2,408 feet; Palmer Corp.'s No. 2 Hunter, SW SW Section 8-19-14, 30 bbls. at 2,411 feet, and Standard Oil Co.'s No. 3 Oden, SW NE Section 18-19-14, 57 bbls. through 2-inch tubing from 2,420 feet. The Ray-Dawes well is flowing with drill stem in the hole. Gold & Sklar's No. 2 Hunter in the SW NE Section 17-19-14, the discovery section, was a failure at 2,470 feet and Gulf Refining Co.'s No. 5 Oden, NW NE Section 18-19-14, also was abandoned, total depth 2,454 feet. Gulf made location for No. 3 Hunter in the NE cor. NE NE Section 17-19-14. The district's production has declined rapidly in the last two weeks, total runs for the last 24 hours being only 1,787 bbls. from 18 wells, including the 1,500 from the Ray-Dawes well.

Dixie Oil Co.'s No. 101 Dillon, Section 13-21-15, made 167 bbls. initial from the chalk rock at 1,628 feet. Its deep well in the same section, No. 92 Dillon, was testing and had bailed down 6,100 feet without a show and found the hole bridged. Total depth is 6,351 feet. Two deep tests in Caddo were among the abandoned holes, Magnolia Petroleum Co.'s No. 18 Dillon in Section 24-21-15, Pine Island, was dry at 4,866 feet and No. 18 Doan-Thigpen, Section 6-20-15, Oil City district, got drill stem stuck and abandoned the hole at 3,687 feet. Location was in what had been regarded as barren territory but in which the company got production about a year ago from a new horizon at 3,000 feet. The Texas Company's No. 70 Levee Board, Section 27-21-16, Oil City, pumped 60 bbls. initial, total depth 1,826 feet, and L. A. Warren abandoned No. 1 Ivins, Section 33-22-15, at 1,730 feet as a dry hole. The Texas Company is drilling No. 71 and made location for No. 72 Levee Board in the same section.

Ouachita Parish Gas Wells

Six of the nine gas wells were in Ouachita Parish of the Monroe district. Austin & Jordan's No. 1 H. M. McGuire, Section 11-18-3, gauged 1,040,000 feet at 925 pounds, total depth 2,276 feet. Bahan & Bahan's No. 1 Frierson, Section 18-19-4, gauged 3,110,000 feet at 740 pounds, total depth 2,170 feet; B. J. Dickinson's No. 1 Stubbs, Section 27-19-4, made 6,175,000 feet at 740 pounds, total depth 2,201 feet. Imperial Oil & Gas Products Co.'s No. 8 Stubbs, Section 18-19-4, made 3,613,000 feet at 835 pounds, total depth 2,165 feet. Magnolia Petroleum Co.'s No. 2 fee 404, Section 15-19-5, tested 9,000,000 feet on drill stem test at 2,304 feet and H. L. Woods' No. 1 Miller, Section 18-18-5, gauged 1,818,000 feet at 752 pounds, total depth 2,260 feet.

Ouachita Natural Gas Co. had planned to go to 3,500 feet with No. 2-B D'Arbonne, Section 25-19-2e, a wildcat southwest of Monroe, which had been shut down and under water since the first of the year, but while cleaning out to deepen most of the hole caved in and hopelessly stuck the drill stem, and it probably will be abandoned, total depth 3,340 feet.

Root Refineries, Inc., which shut down No. 1 Home Savings & State Bank, Section 8-13-10, at 2,667 feet to which it was drilled after a test at 2,570 feet showed a little oil with salt water and another at 2,598 feet showed gas, will drill deeper as a result of the Eylers Oil Co. well, going to 2,900-3,000 feet "unless."

Magnolia Petroleum Co. abandoned No. 3 C. M. Noble in the SE NE Section 34-16-5, Richland Parish, in the southwest corner of the field, at 2,658 feet where it tested salt water, not having found any gas on the way down.

Pleasant Hill Well Consistent

Pleasant Hill's star well, Clark-Bridges Oil Co.'s No. 1 Williams, Section 33-10-12, Sabine Parish has remained at 900 bbls. daily production for the last 10 days and the company has made location in the SE NE of the same section for No. 2 Williams, making the third offset to the big producer which is the first well in the pool that has flowed steadily for so long a time.

Bahan & Bahan's No. 1 School, Section 10-20-3, Union Parish, was an 8,070,000-foot gasser at 1,100 pounds, total depth 2,164 feet. The Sarepta district of Webster Parish furnished Magnolia Petroleum Co. another producer in No. 1 Sally Coyle, Section 2-22-11, pumping 179 bbls. of oil and 30 of salt water from a total depth of 2,695 feet. Gardner, Harter & Brown's No. 14 Harper, Section 23-10-1e, Winn Parish, in the Urania Pool, pumped an initial 60 bbls. from 1,505 feet, total depth.

Big Shallow Gasser

Magnolia Petroleum Co. got a big shallow-sand gasser in Champagnolle, No. 1 Gregory, SW SW Section 15-17-14, Union County, Arkansas, gauging 24,256,000 feet at 850 pounds, total depth 2,841 feet, the first completion in the district in several weeks. Ohio Oil Co. abandoned No. 1 Stout Lumber Co. in Section 31-14-12, Calhoun County, as a dry hole at 3,612 feet and T. R. Brown's No. 1 Spencer, Section 18-18-22, Columbia County, in which Humble Oil & Refining Co. was interested, also was a duster, total depth 3,500 feet. This cleans up all the wells the Humble had under way when the transfer of its wildcat acreage to the Standard Oil Co. of Louisiana was made last June.

Average Daily Production for the Week Ending August 24
North Louisiana

	Bbls.
Caddo, light	8,900
Caddo, heavy	3,230
Homer	3,900
Haynesville	4,980
DeSoto-Red River	3,855
Elm Grove	545
Bellevue	620
Cotton Valley	2,400
Urania	6,450
Pleasant Hill	1,310
Sarepta	200
Total	36,440

Arkansas

El Dorado	4,620
Smackover, light	6,045
Smackover, heavy	46,100
Stephens	990
Nevada	1,050
Lisbon	1,315
Champagnolle	6,575
Bradley	90
Total	66,680
Total both states	103,120
Total previous week	102,989
Increase	131

Columbia County Tests

Arpeco Syndicate's No. 1 Dennis, Section 11-20-23, Columbia County, Arkansas, tested salt water at 3,696 feet but will plug back and test again around 3,000 feet. T. T. Word has made location for a well in the center of his 12,000-acre block in Townships 19 and 20, Ranges 19 and 20, Columbia County, and Township 23, Ranges 7 and 8, Claiborne Parish, Louisiana. It is on the highway between Haynesville and Magnolia, 1½ miles north of the state line. His leases call for a 4,000-foot hole but as he has a machine "high," it is understood he has doubled this figure and will go to 8,000 feet if necessary. Wroght Oil Co.'s No. 4 Groves, Section 12-14-21, Nevada County, waiting on standard rig at 1,140 feet for the last several months, has been abandoned because of litigation.

Lentz and others' have derrick up on the Persons farm in the NW cor. Section 13-15-26, Miller County, for a test to go 3,500 feet. In a total of 18,000 acres he has disposed of three of five units of a 12,000-acre block to finance the hole.

Developing Smackover Shallow Sands

There seems to be increasing activity in development of the shallow sand in Smackover both by new wells and in plugging back and perforating old producers drilled to the deep pay. Phillips Petroleum Co. and other operators have completed a few good producers recently and the former is standardizing another and drilling in on a third. Simms Oil Co. is moving in two rigs to drill an offset lease. While most of the wells that have been perforated in the shallow sand have made large amounts of water, they also have made sufficient oil to well warrant the experiment.

Cotton Valley

Ohio Oil Co.'s No. 44 Bodcaw, Section

(Continued on Page 334)

WILDCAT OPERATIONS IN LOUISIANA-ARKANSAS

NORTH LOUISIANA

BIENVILLE PARISH

Company, farm and location—	Remarks:
W. G. Gray's No. 1 Snyder, SW NE, Sec. 15-17-6	Drlg. brown shale 3,260 ft.

BOSSIER PARISH

Corbett et als' No. 1 Murff, SE cor. NE, Sec. 18-17-11	S.D. 990 ft.
Nell & Lanier's No. 1 Biedenharn, SE cor., Sec. 23-21-14	S.D. 790 ft.
Triangle Drlg. Co.'s No. 1 Thigpen & Herold, 1,320 ft. W, 660 f., N, SE cor., Sec. 11-17-12	Cmtd. 12½-in.; drlg. 868 ft.
Walker et als' No. 1 Antrim, NW cor. SE, Sec. 28-22-13	Drilled 4 ft. deeper; bailed dry; T.D. 3,021 ft; S.D.
Woodmansee et als' No. 1 Bollinger, SE cor. NE, Sec. 9-22-11	S.D. waiting orders 3,532 ft.

CADDO PARISH

D. C. R. Oil Co.'s No. 2 Oden, 892 ft. W, 264 ft. S, NE cor. NE NW, Sec. 20-19-14	S.O.; tested dry 2,445 ft; S.D; W. O. 2,550 ft.
Lide et als' No. 1 Levee Board, 200 ft. S, 200 ft. W, NE cor., Sec. 24-19-15	Spudded Aug. 20; cmtd. 10-in at 83 ft.
Fred McWilliams' No. 1 Oden, 1,650 ft. S, 330 ft. W, NE cor., Sec. 20-19-14	Rig up.
S. T. Oynett, trustee's No. 1 Dixon, SW cor., Sec. 10-19-14	Drlg. chalk 1,738 ft.
I. N. Phariss, trustee's No. 1 Oden, NE cor. SE NE, Sec. 19-19-14	Rig up.
Haynes Bros.' No. 1 Oden, NE cor. NW, Sec. 19-19-14	Tes.ed dry; small show oil; swabbing; T.D. 2,425 ft.
Lide et als' No. 1 Hunter, 200 ft. S, 200 ft. E, NW cor., Sec. 22-19-14	S.D. repairing rig; T.D. 1,872 ft.
R. W. Norton's No. 1 Hill, 630 ft. N, 1,260 ft. W, SE cor. NE, Sec. 33-23-16	Spudded Aug. 21.
Simplex Oil Co.'s No. 1 Dickson, 660 ft. N and E, C, Sec. 33-20-14	Tested dry 2,468 ft; S.D. waiting orders 2,702 ft.
A. H. Tarver's No. 1 Glassell & Dickson, 300 ft. N, 300 ft. E, SW cor., Sec. 31-20-14	Tested S.W. 2,470 ft; plugging back.
Woodley Pet. Co.'s No. 1-B Knight, Sec. 11-15-12	Arranging to deepen; T.D. 1,936 ft.

CATAHOULA PARISH

Lochnager Pet. Co.'s No. 1 Tallaferro, 572 ft. E, 396 ft. S, C, Sec. 26-9-6	S.D. 900 ft.

CLAIBORNE PARISH

Nesbit et als' No. 1 Mosley, 330 ft. S, 330 ft. E, NW cor., Sec. 29-20-5	S.D.; drlg. wtr. well; T.D. 1,954 ft.
El Dorado Chief Oil Co.'s No. 1 Dance, C SW NE, Sec. 27-20-7	S.D. 1,115 ft.

(Continued on Page 339)

New Gas Pool Opened in Laredo Area

Magnolia Petroleum Co. Gets 30,000,000-Foot Well
2½ Miles Southwest of Nearest Oil or Gas Production

By B. D. Stevenson
Staff Correspondent, Southwest Texas Fields

SAN ANTONIO, Tex., Aug. 26.—Magnolia Petroleum Co. has opened a new gas pool in the Laredo district just as the company's first gas line out of that district was nearing completion. Its No. 1 F. G. Martinez, in Zapata County, 150 feet out of the NW cor. of the E half of Survey No. 6, and about 2½ miles southwest of the nearest oil or gas production in the Henne, Winch & Fariss Pool is a 30,000,000-foot gas well with 620 pounds rock pressure at 1,922 feet. Production in the Henne, Winch & Fariss Field is at about 2,150 feet.

The test is surrounded by pools but none of them producing from that depth and probably not from that sand. Not all is known about this sand yet. The Randado Pool in Jim Hogg County, a few miles to the southeast is producing oil at 1,300 feet. The old Mirando Pool, 6 miles north and the new Killam oil pool just east of the Jennings Field and 2½ miles west of the new Magnolia gas discovery are each producing at 1,465 feet and the latter also in a new sand at 1,598 feet. There is not much difference in the elevations. The new pool is not far distant from gas lines, but the Magnolia will probably extend its new line down to the field if it develops sufficient importance.

Other features of the Laredo district were the bringing in of the Southern Oil Co.'s No. 1 King Harper, 150 feet south of the north line and 1,560 feet from the east line of Survey 323 at the north end of the Cole gas field. It is a 10,000,000-foot gas well at 1,767 feet. It amounts to a small extension of the field.

John J. O'Hern brought in a 47,000,000-foot gas well at 2,329 feet in the SE NE, Survey 694, in about the middle of the gas area that lies north of the Magnolia-Cole oil pool in southeastern Webb County.

While the new pool of the Magnolia in Zapata is the outstanding development in the Laredo district for the week, there were other things of interest. O. W. Killam abandoned his No. 11 Bruni in Survey 3, a mile southwest of Bruni and about that far northwest of where he and Trussell and others have been trying to find an oil field. They have been successful in finding gas and a little oil. Killam's No. 11 Bruni is abandoned dry at 2,625 feet. The production thus far discovered in that territory is at around 2,350 feet. He has made another location about a mile south of it for the No. 12 Bruni.

Henne-Winch-Fariss

It looks as though W. R. Shankle will make an oil well out of his No. 1 Holbien in the northwest part of Jim Hogg County northeast of the nearest production in the Henne-Winch-Fariss Pool and a half mile southwest of the nearest production in the Albercas Pool. It was reported last week as estimated at 10,000,000 feet of gas spraying oil at 2,138 feet, as a result of a drill stem test. It set 6⅝-inch casing at 2,128 feet and this week is reported to be going on the pump.

Carolina-Texas Pool

Interesting rather than important is a showing of oil in the Carolina-Texas Oil & Gas Co.'s No. 8 Benavides in the Carolina-Texas Field in Webb County at around 2,125-35 feet. It is an inside location and there is known to be gas sand at that depth. The test shows both gas and oil. Some wells in the field are producing gas at that depth but no record is at hand of any test in that sand showing oil. It was understood this was to be a deep test and that it would probably go deeper than anything else drilled in the field and the deepest hole thus far is at around 4,000 feet.

Trapshooter Reilly's No. 2 Benavides on the south edge of the same pool and a location or so west of his No. 1 Benavides is drilling at below 2,860 feet. His No. 1 made an oil well at a little below 3,000 feet. His No. 2 tried to pick up the 2,100-foot sand but found it dry and it also was feeling for the 2,600-foot sand but seems to have found it not promising. At 2,140 feet he had a little showing of oil. Sands at 1,200 and 2,600 feet produce farther north in the field.

Zapata County

H. Muckelroy, Jr. has set casing and Blair & Acklin have a showing of oil in their tests in Zapata County near the Muckelroy No. 1 Trevino which a few weeks ago came in an oil well in wildcat territory opening a new pool. Blair & Acklin's No. 1 Trevino got a showing of oil at only 385 feet. The Muckelroy, Jr.'s No. 3 Trevino set casing to test a sand at 1,293-95 feet.

San Antonio Territory

Darst Creek Field in Guadalupe County now has two producing oil wells and one dry hole. The Texas Company's No. 1 Lemmie Anderson, a 300-foot north offset to the same company's discovery well of the field is in, swabbing 800 bbls. at a total depth of 2,631 feet, which is about 20 feet deeper than the discovery well and a little farther into the Edwards lime.

The dry hole for the Darst Creek Field is the Cranfill & Reynolds' (Strube & Strube) No. 1 Denman, a half mile north of the discovery well. It stopped at 2,703 feet not having reached the Austin chalk. Its elevation is 511 feet and the elevation of The Texas Company's No. 1 Lemmie Anderson, north offset to the discovery well is 510 feet. The Lemmie Anderson topped the chalk at 2,228 feet. There is therefore a fault line displacement of at least 416 feet and if the No. 1 Denman were continued to the chalk some think it would not get it short of at least 500 feet below the discovery well or the No. 1 Lemmie Anderson which topped it at about the same.

There seems to be some possibility that the gentleman's agreement to shut down the Darst Creek Pool for 90 days may not survive the full 90 days. Texas is running out about 1,000 bbls. of oil a day and the other companies seem to want some for themselves. Drilling may start up in that field most any time.

Bob Penn's Well

Bob Penn's No. 1 Manford in Guadalupe County between the Joe Bruner Field on the northeast and the Darst Creek stuff on the southwest has succeeded in setting 6⅝-inch casing at 2,418 feet but it may be several days before it is drilled in.

Bee County Situation

The Mission Drilling Co. is getting ready to make a test of its No. 3 Ray in Goliad County, 3 miles east of this company's discovery well in the Pettus Field. The discovery well is a big gas well at 2,890 feet and the No. 3 Ray is now at 4,062 feet having topped a sand at 4,053 feet that on a drill stem test made about 20 fourbles of oil and drilling fluid about 50 per cent oil. The No. 3 failed to picked up the sand at 2,890 feet, but it is looking now as though it was a good thing that it did not. The expectation is that when it tests out it will make a good oil well. The Mission Drilling Co. is a subsidiary of the United Gas Co. (Moody-Seagraves) and the company officials, it is understood, will be present in force when the test is made.

The Houston Oil Co. has made a location for a test on its block 3 miles east of the Mission Drilling Co.'s No. 3 Ray which is as close as it can get to the well. F. P. Zoch has a location in Goliad, a little to the northeast and The Texas Company lately took a big block north of the Pettus Field. That area will be much in the limelight from this on regardless of the outcome of the test of the No. 3 Ray, since the showing of oil on the drill stem test is enough to keep attention riveted there. More than that the north end of the Bee and Goliad Counties are leased nearly solid by big companies.

Shell Petroleum Co. is also reported to have made a locatioin in Goliad County on a block of its leases. The information has not been confirmed, but if true the location would be about 8 miles away.

Milam County

In Milam County in approximately the center of the Rockdale-Minerva Pool the Texas Petroleum Development Co. is starting a deep test that will go to the Edwards lime and it will be the first in the field. The production in that field is from the Taylor marl.

A deep test is also to be made in the Agua Dulce Field in Nueces County by the Agua Dulce Oil & Gas Co. of which the Moody-Seagraves interests are half owners. There are several good gas wells producing at about 2,000 feet in that pool and no other depths have been tested.

The block taken by The Texas Company north of the Pettus Field in Bee County amounts to 13,500 acres considerable of it being in Karnes County at the point where Bee, Karnes and Goliad come together. The Texas Company will begin core drilling this block next month.

SOUTHWEST TEXAS
Daily Average Production Week Ending August 24

Branyon	27
Bruner	47,280
Dale	449
Darst Creek	0
Kingsville	672
Larremore	160
Luling	11,447
Lytton Springs	963
McMullen County	35
Medina County	32
Mirando	10,393
Somerset	1,768
Yoast	1,160
Total	74,386
Week ending August 17	75,296
Decrease	910

Humble Field—Duval

Humble Oil & Refining Co.'s No. 22 Kohler, Survey 395, located 495 feet west line, 165 feet north line at 2,854-78 feet, showing gas, oil and salt water; No. 30 Kohler, Survey 169, located 165 feet north and west lines, at 1,760 feet placing on pump; No. 33 Kohler, Survey 164, located 330 feet north and west lines ready to spud in; No. 34 Kohler, Survey 396, located 330 feet south and east lines, ready to spud in. Houston Oil Co. of Texas' No. 1 Peters, Survey 161, located 495 feet west line, 165 feet south line, location. Sun Oil Co.'s No. 2 Lopez, Survey 730, located 1,000 feet south line, 150 feet east line, rigging up.

Piedras-Pintas Dome

Suladie-Peters-Jack's No. 1 Walsh, Survey 185, located 800 feet west line, 900 feet south line, location.

Schoolfield-O'Byrne Field

C. E. Long's (Shell) No. 1 C. W. Hahl, Survey 280, Block 24, located 150 feet north line, 750 feet east line, rigging up. Magnolia Petroleum Co.'s No. 6 Hahl, Survey 250, Block 24, located 150 feet north line, 1,050 feet east line, drilling at 2,311 feet; No. 7 Hahl, Survey 250, Block 24, located 150 feet east line, 750 feet north line, location; No. 7-B Hahl, Survey 61, located 650 feet south

(Continued on Page 333)

WILDCAT OPERATIONS IN SOUTHWEST TEXAS

ARANSAS COUNTY

United North & South Dev. Co.'s No. 1 Kate Edwards, Lewis Sur. ..... Coring sand 1,598 ft.

ATASCOSA COUNTY

Tom Draper's No. 1 McCoy, Sur. 234 ..... Location.
Amphion Oil Co.'s No. 1 Sam Schlisser ..... Shut down 2,300 ft.; repairing rig.

BASTROP COUNTY

Gulf Production Co.'s No. 2 Bell, Riley Sur. ..... Location.
Jim Harper and others' No. 1 R. R. Mitchell ..... Moving in.
Howell Oil Corp.'s No. 1 F. Wichman ..... Drlg. 1,995 ft.
Nelson et al's No. 2 Rundus, 100 ft. N of No 1 ..... Drlg. 1,245 ft.; small gas showings.
Hadley Oil Co.'s No. 1 F. Kiel, R. H. Grimes Sur., 150 ft. E line, 1,000 ft. S line ..... Location.
E. W. Ogden's No. 1 Goodman ..... Drlg. 2,540 ft.
Pacific Oil & Gas Co.'s No. 1 Darnell & Bickler, Martha Baker Sur. ..... Shut down.
Pacific Oil & Gas Co.'s No. 1 Spooner, Leverenz Sur. ..... Drlg. 2,420 ft.
Moore & Ortman's No. 1 Ortman, Andrew Graham Sur. ..... Location.
Superior Oil Co.'s No. 1 R. J. Moore, J. Raines Sur. ..... Location.

BEE COUNTY

F. P. Zack's No. 1 Pettus Lucus ..... Moving in rig.

BEXAR COUNTY

Balcones Oil Corp.'s No. 1 F. A. Jackle ..... Drlg. 2,183 ft.; dry, waiting orders.
Guy S. Fisher's No. 1 S. L. Beck, P. W. Hays Sur. ..... Spudded in.
Hamilton & Kennon's No. 1 Hamilton, near Gas Ridge ..... Spudded in.
Moore-Jauer's No. 1 Holly R. Ellison ..... Drlg. 1,705 ft.
Mrs. A. R. Garrett's No. 1 Ponciano Pena ..... Drlg. 540 ft.
C. J. Le Compte's No. 3 R. Diaz, J. M. Urrigas Sur. ..... Location.
Leon Oil Co.'s No. 1 Reiniger, 300 ft. E line, 215 ft. S line ..... Location.
E. G. Potter's No. 1 Watson, B. Martinez Sur. ..... Repairing rig 2,118 ft.

BLANCO COUNTY

J. Bekning's No. 1 Butler, Butler Sur. ..... Moving in machinery.
J. E. Forbes and others' No. 1 Bruckner ..... Drlg. 1,007 ft.
Ashe & Marshall's No. 1, 5 mi. S Johnson City ..... Spudded in.

BROOKS COUNTY

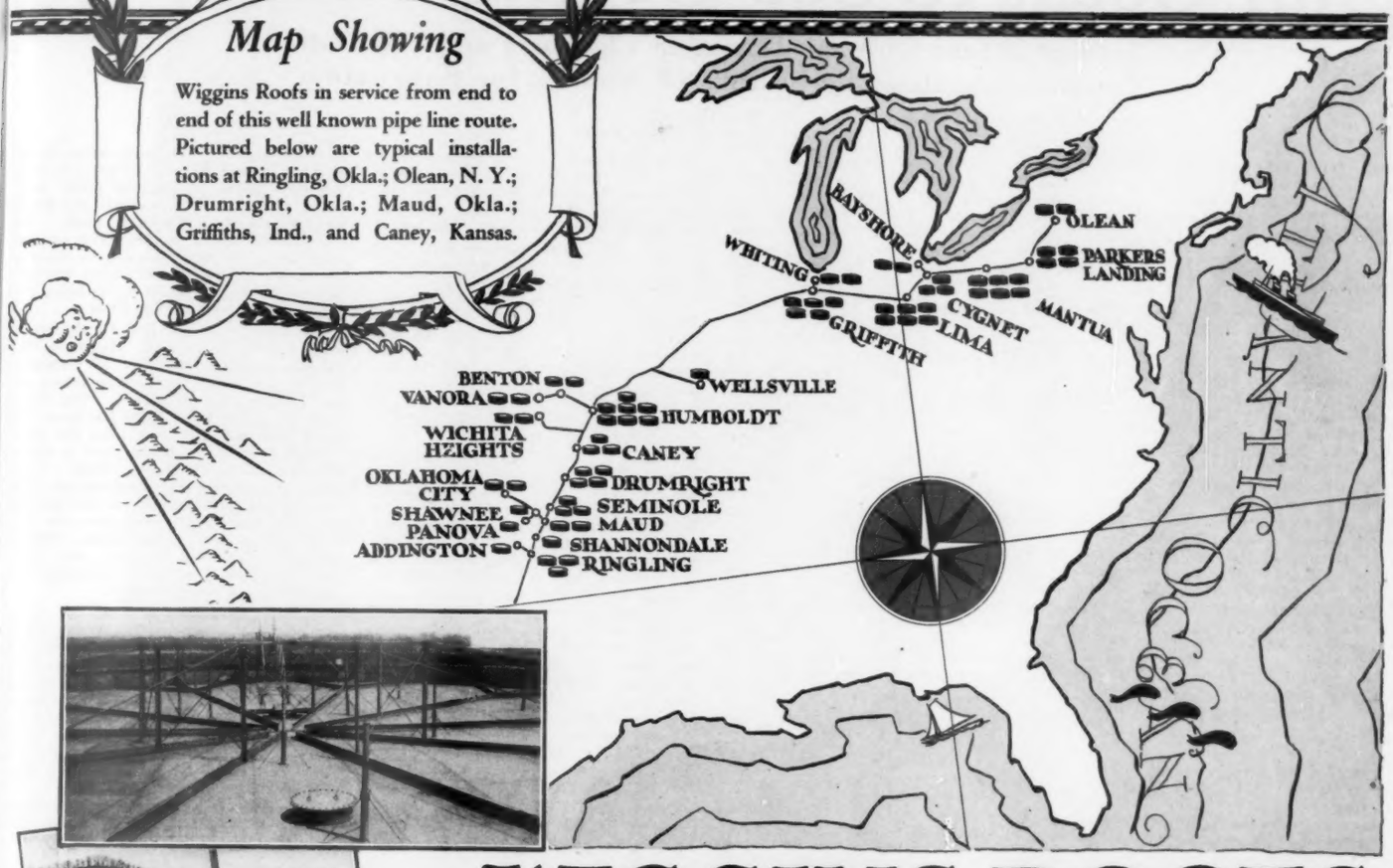
Milam Drlg. Co.'s No. 6 Reilly Allen, SW part of county ..... Formation test; drlg.
A. W. Dinn's No. 1-B Garcia ..... Shut down 450 ft.
Houston Oil Co. of Texas' No. 1 Lassiter, Survey 69 ..... Standing 3,500 ft., contract depth; waiting orders.

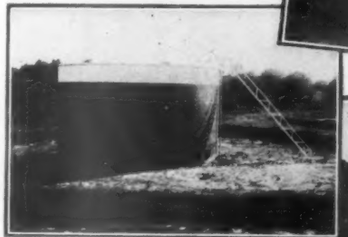
CALDWELL COUNTY

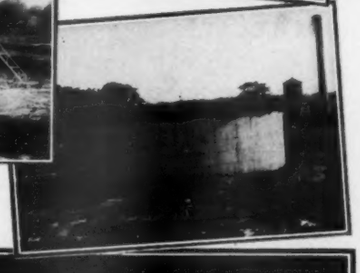
Cranfill & Reynolds' No. 1 Berensdorf, A. Floyd Sur. ..... Location.
Cranfill & Reynolds' No. 2 Dauchy ..... Drlg. 1,872 ft.
W. H. Harper's No. 3 Thomas, J. Roberts Sur. ..... Moving in machinery.
H. C. Ratcliff's No. 1 J. E. Cardwell, J. P. Bell Survey ..... Spudded in.
John T. Callahan and others' No. 1 W. Ellison ..... Drlg. 2,497 ft.
J. S. Brutsche's No. 1, R. L. Quinn Sur. ..... Location.

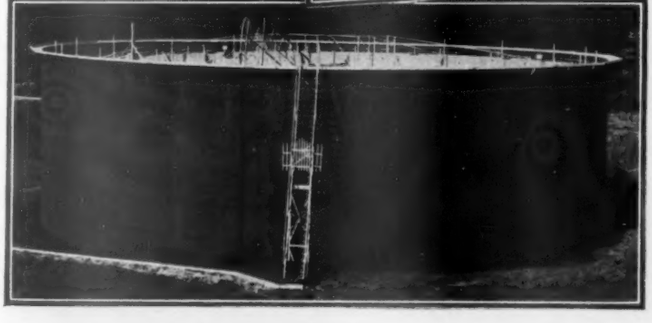
Map Showing

Wiggins Roofs in service from end to end of this well known pipe line route. Pictured below are typical installations at Ringling, Okla.; Olean, N. Y.; Drumright, Okla.; Maud, Okla.; Griffiths, Ind., and Caney, Kansas.









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Cleveland . . . . 2204 Union Trust Bldg.	San Francisco . . . . . 1054 Rialto Bldg.
Chicago . . . . . 2128 Old Colony Bldg.	Havana, Cuba . . . . . Apartado 2507

Gulf Coast to See Geophysical Hunt

Interest in Search for Salt Domes in Chambers and Jefferson Counties Stimulated by Leasing of Acreage for Exploration

By Neil Williams
Staff Correspondent, Gulf Coast Fields

HOUSTON, Tex., Aug. 26.—New interest in the search for additional salt domes in Chambers and Jefferson Counties was stimulated the last week with the leasing of three large blocks of acreage in these counties for geophysical exploration. The blocks include what generally are known as the McFaddin ranch in Jefferson County and the Jackson and White ranches adjoining in Chambers County. The former was taken by the Humble Oil & Refining Co. and the latter two were taken by the Rycade Oil Corp. The three blocks are among the most favorable prospects in the Gulf Coast.

The McFaddin ranch, which lies in the central western part of Jefferson County, comprises approximately 92,000 acres, of which the Humble Oil & Refining Co. has taken up in the neighborhood of 84,000 acres with options on acreage on and around any domes which may be found by shooting. The blocks in the Jackson and White ranches in Chambers County taken by the Rycade Oil Corp. comprise a total of about 75,000 acres, which also will be "shot" with the seismograph.

The finding of deeply seated dome prospects in these two counties within the last year, a territory in which few salt domes had been found before has turned attention to that part of the Coast. Adjoining the McFaddin ranch are the Herbert-Broussard block held by the Vacuum Oil Co. and the Burrell block by The Texas Company on each of which a deeply seated dome has been checked and on each of which the first tests are drilling. On a block adjoining the Rycade in Chambers County the Petty Oil Co. has checked recently another dome prospect. In the same general part of Jefferson County lies Gulf Production Co.'s Fannette Dome and also Shell Petroleum Corp. has a prospect on which it is drilling its first test.

The taking of these blocks is part of the active leasing and geophysical exploration which has been going on in all parts of the Gulf Coast, both in southern Louisiana and in Texas, but because of the prominence of the ranches involved and their extent, the leasing in Jefferson and Chambers County was of particular interest.

The blocking by Rycade marks a return of that company to active participation in Gulf Coast exploration. Coincidentally with this, Rycade has just taken a 16,000-acre block in northern Vermilion Parish, Louisiana, which will be "shot" by that company and is working on another prospect in Harris County, Texas. The Louisiana prospect has been looked upon by operators as another extremely favorable prospect.

Most Active Plays

In field operations, the development of the deep sands south of Humble and at Barbers Hill continued the most active plays on the Gulf Coast. Both now indicate the proving up of what may be two of the coast's most prolific producing areas. The increasing daily output of these two domes put the daily average production of the coast to nearly 163,000 bbls. the last week, the highest it has been in the last two years. Three new deep wells at Humble within the last 10 days gave that field a daily average for the week of close to 12,000 bbls. while at Barbers Hill a production of 22,000 bbls. brought the average there to nearly 18,000 bbls.

At Barbers Hill, Humphreys Corp. late in the week brought in its No. 1-H Kirby flowing at the rate of 1,450 bbls. of pipe line oil from a sand at approximately 5,100 feet. Rexal Oil Co.'s No. 1 Cockburn in the same area would not flow after setting screen at 5,207 feet and washing and now it is bailing. A half dozen other tests are on or near the deep sands, promising further developments during the coming week.

At Humble eight new deep tests on the south side of the dome are getting under way. The South Texas Petroleum Co.'s No. 9 Morris, flowing 1,800 bbls. daily at 5,028 feet, brought in Tuesday is the latest completion in this area. On the north side of Humble, The Texas Company got a small well in a deep sand at 4,339 feet, this being No. 35 Koehler which is estimated as good for 200 bbls. of oil. Harvey Smith's No. 1 Rosenthal at Humble looked like a good well when it came in but it flowed only a short time. It is in a sand at 4,205 feet, but is in an older part of the field.

The new field opened in western Liberty County near Stillson and Sheeks continued in the limelight, and, according to coastal operators, is one of the most promising new districts in the coast. The purchase by Yount Lee Oil Co. of the discovery well, Harvey Smith's No. 1 Moore's Bluff Corp., and the 34.8-acre tract on which it is located, is expected to have an important bearing on the early proving up of this prospective dome as Yount Lee Oil Co. is considered the coast's most active wildcatter.

Discovery Holds Up Well

The discovery well, which increased its output during the week, is holding up remarkably well. Two offsets have been started by Cranfill & Reynolds (Union Exploration Co.), one on the latter's Esperson tract to the west and the other on the Vajdak tract to the north. The latter company's No. 3 Esperson, approximately 2,000 feet to the west and north of the discovery well which came in from a shallow sand at 1,834 feet early in the week, now is flowing approximately 2 bbls. of oil an hour. Although this is not a large well, the completion of these two producers in a new area within a few days of each other is looked upon with favor.

With the exception of those at Barbers Hill and Humble, completions the past week were of little importance. Dan Harrison's No. 4 Quintette at North Dayton, although within 200 feet of No. 3, which was completed as a 4,000-bbl. producer and which since has made one of the most consistent producers on the coast, was brought in as a gas well from the sand at a total depth of 4,068 feet.

Other completions included Salt Dome Oil Co.'s No. 2 Grace Shaw, Vinton, pumping 10 bbls. net oil, 2,859 feet; Vinton Petroleum Co.'s No. 9 Rescue, Vinton, flowing 350 bbls. oil, 3,147 feet; Brownie Babbett Oil Co.'s No. 6 McLean, Orange, pumping 10 bbls. net oil, 3,570 feet; Republic Production Co.'s No. 114 Dolbear, Hull, flowing 300 bbls. fluid, 18 per cent water, 2,497 feet; The Texas Company's No. 1 Hannah, Hull, pumping 150 bbls. fluid, 30 per cent water, 2,976 feet; Humble Oil & Refining Co.'s No. 6 Bashara, Sour Lake, pumping 200 bbls. fluid, 60 per cent water, 1,979 feet; Humble Oil & Refining Co.'s No. 7 Hamner fee, DeWalt, flowing 700 bbls. oil, 3,600 feet; Yount Lee Oil Co.'s No. 109 McFaddin, Spindletop, flowing 300 bbls. oil, 3,996 feet; Yount Lee Oil Co.'s No. 2 fee, Spindletop, flowing 400 bbls. oil, 4,001 feet; Sun Oil Co.'s No. 11 McLean, Spindletop, 100 bbls. fluid, 95 per cent water, 5,639 feet; Rio Bravo Oil Co.'s No. 79-C, Saratoga, pumping 20 bbls., 1,091 feet; Humble Oil & Refining Co.'s No. 4 Gotosky, Raccoon Bend, flowing 372 bbls., 3,280 feet; the same company's No. 2 Buchanan, Raccoon Bend, a small pumper, 3,414 feet and Anderson & Plummer's No. 5 Whitehead, Pierce Junction, 200 bbls., 3,541 feet. All the above completions except at North Dayton, DeWalt, Raccoon Bend and Vinton are workovers.

Abandonments Numerous

Among the numerous abandonments during the week was Humble Oil & Refining Co.'s No. 1 Miller in the Lester E. Cross Survey near Rosenberg, Fort Bend County. This test which failed to develop anything of interest after being drilled to 5,371 feet, was the first drilled on a torsion balance dome prospect recently checked by the Humble Oil & Refining Co.

Humble's wildcat gas well at Mykawa, Harris County, is standing shut in but estimated good for 50,000,000 feet per day. No new locations on that dome prospect had been made known late in the week.

Shell Petroleum Corp.'s No. 1 Miller, which was drilled on what was checked by that company as a deeply seated dome in the Lockport district, flowed salt water when testing a sand at 6,692 feet. This test is slightly over a half mile from Vacuum Oil Co.'s Lockhart Field. As the latter is one of the few fields on the coast which are not known to be domes, the Shell test was of particular interest because of the likelihood of its being on the dome for the Lockport Field.

Yount Lee Oil Co. late in the week made location for a rank wildcat in the extreme southwestern part of Cameron Parish, Louisiana, in what is known as the Johnson Bayou district. The location, No. 1 Starks, is 1,500 feet from the north line and 1,100 feet from the west line of Section 1-15s-15w, and a short distance south of Sabine Lake. Like many other new coastal operations, this location is in an extremely low and marshy territory which will necessitate the expenditure of large sums before drilling actually begins but seepages and other signs in that area have indicated the existence of a possible dome.

Placing by Yount Lee Oil Co. of a number of old wells in the Welsh Field on the pump during the week accounted for an increase in production of that field to above 600 bbls. daily. Welsh, one of the oldest fields on the coast, although never prolific, has been inconspicuous for years as only a few wells have been worked and these only part time and daily output of the field has been only between 35 and 50 bbls.

Daily average production of coastal fields for the week ending August 24 was:

GULF COAST
Daily Average Production Week Ending August 24
TEXAS

Allen	12
Barbers Hill	17,815
Batson	1,307
Big Creek	3,952
Blue Ridge	2,771
Brenham	475
Boling	1,446
Clay Creek	2,175
Damon Mound	640
DeWalt	12,505
Fannette	123
Goose Creek	5,577
High Island	1,317
Hull	9,245
Humble	11,832
Jasper County	18
Lost Lake	195
Markham	376
Nash	475
North Dayton	540
Orange	2,763
Orchard	107
Pierce Junction	12,156
Port Neches	600
Refugio	4,121
Raccoon Bend	8,028
Sheeks	650
Saratoga	934
Sour Lake	2,636
South Liberty-South Dayton	4,804
Spindletop	25,758
West Columbia	6,406
Total Texas Coast	141,759
Week ending August 17	137,931
Increase	3,828

SOUTH LOUISIANA

Anse La Butte	100
Bayou Bouillon	200
Black Bayou	98
Dog Lake	40
Edgerly	735
Jennings	2,234
Hackberry	4,943
Lockport	3,786
Port Barre	133
Sorrento	187
Starks	390
Sulphur	3,235
Sweet Lake	35
Vinton	4,456
Welsh	610
Total South Louisiana	21,182
Week ending August 17	20,246
Increase	936
Total Gulf Coast	162,941
Week ending August 17	158,177
Increase	4,764

GULF COAST FIELDS AND WILDCATS

Week Ended August 24

BARBERS HILL—CHAMBERS COUNTY

Mills Bennett Production Co.'s No. 1 Collier (southeast).. Drlg. sand and rock 2,153 ft.
Mills Bennett Production Co.'s No. 1 Barber (north side).. Drlg. shale and lime 8,767 ft.
Mills Bennett Production Co.'s No. 7 Barrow (workover).. Drlg. shale 4,495 ft.
Mills Bennett Production Co.'s No. 1 Hammon-Armstrong (workover) ..... Set screen 5,196 ft.
Mills Bennet Production Co.'s No. 2 Hammon-Armstrong (southeast) ..... Derrick.
Humphreys Corp.'s No. 8-A Kirby, east flank ..... Drlg. hard sand and lime 5,699 ft.
Humphreys Corp.'s No. 1-H Kirby, east flank ..... Comp. flowing 1,450 bbls. pipe line oil 5,100 ft.
Humphreys Corp.'s No. 3-H Kirby, east side ..... Coring sand and shale showing oil 5,200 ft.
Humphreys Corp.'s No. 1 Tarbutton, east flank ..... Cemented casing to test oil sand 5,187 ft.
D. B. McDaniels' No. 1 Woodward (southeast) ..... Drlg. gumbo 3,814 ft.
D. B. McDaniels' No. 2 Woodward (southeast) ..... Drlg. shale and sand 4,464 ft.
Republic Prod. Co.'s No. 2 McKinney (southeast) ..... Drlg. shale and lime 4,210 ft.
Rexal Oil Co.'s No. 3 McLean, east flank ..... Drlg. shale and lime 4,456 ft.
Rexal Oil Co.'s No. 1 Cockburn, east flank ..... Set screen to test oil sand 5,207 ft.
Sinclair Oil & Gas Co.'s No. 1 McKinney (southeast) .... Drlg. gumbo and boulders 1,782 ft.
Sinclair Oil & Gas Co.'s No. 1 Wilburn (southeast) ..... Drlg. gumbo 1,124 ft.
Sun Oil Co.'s No. 3 Chambers, south flank ..... Waiting cement to set 4,641 ft.
Sun Oil Co.'s No. 1 McKinney (southeast) ..... Drlg. gumbo and lime 3,603 ft.
Sun Oil Co.'s No. 2 McKinney (southeast) ..... Drlg. gumbo 1,149 ft.
Sun Oil Co.'s No. 1 Wilburn (southeast)..... Drlg. shale and lime 2,891 ft.
The Texas Company's No. 1 Wilburn (southeast) ..... Location.
Yount Lee Oil Co.'s No. 4 Chambers, southwest ..... Drlg. hard sand 7,859 ft.
Yount Lee Oil Co.'s No. 1 Kirby, southeast ..... Drlg. shale and lime 5,036 ft.
Yount Lee Oil Co.'s No. 1 Woodward (southeast) ..... Drlg. water sand 4,689 ft.
Superior Oil Co.'s No. 2 Iliffrey, east side ..... Location.

(Continued on Page 325)

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16" Victaulic Coupled Gas Line, First Street Bridge, Los Angeles, Calif.

6" Victaulic Coupled Crude Oil Line, Mission Field, Okla.

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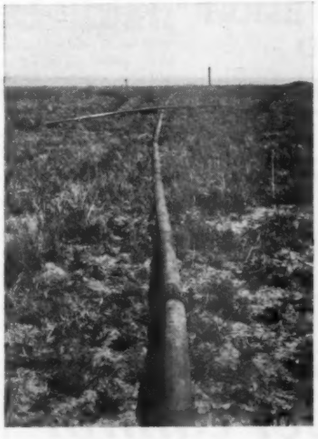

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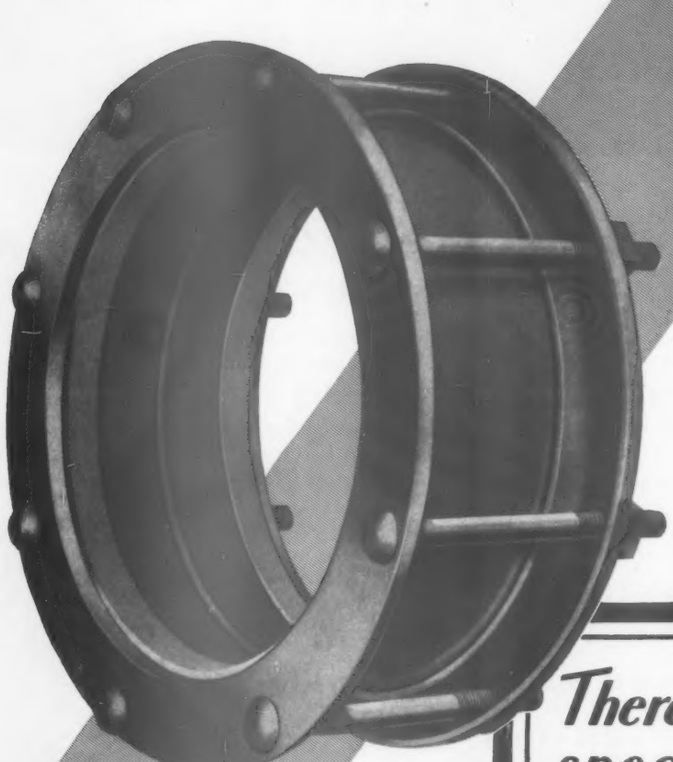

There is no pipe line specification or service demand that a **DAYTON** *product cannot successfully meet.*

THE NATIONAL SUPPLY COMPANIES

Big Gasser Completed on Wertz Dome

Well Producing 80,000,000 Feet Daily, Brought in by Producers & Refiners Corp. in Sundance, Opens New Horizon

By Tolbert R. Ingram
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Aug. 26.—The Wertz Dome in Carbon County, Wyoming, has come into the limelight the last week with an 80,000,000-foot gasser, one of the biggest gas wells completed in the State in a long time. The well, completed by the Producers & Refiners Corp., opens a new horizon. The Ohio Oil Co. has a 6,000,000-foot gasser on the Byron Dome in Big Horn County. The Carter Oil Co.'s No. 2 State on the Billy Creek structure in Johnson County, is pumping better than 500 bbls. a day, opening a new oil horizon on a structure which heretofore has produced gas. The Kinney-Coastal Oil Co.'s test on the Pilot Butte Dome in Fremont County, surprised the operators by slopping over the top after standing while waiting for casing.

The Midwest Refining Co.'s No. 22 Gregory, in the Jal district, Lea County, New Mexico, has a show of oil at 3,315 feet after going through gas horizons making 70,000,000 and 6,000,000 feet.

The Gypsy Oil Co.'s No. 1 Humphreys, an offset to the Skelly well, is being abandoned after encounutering a flow of 4,000 bbls. of water. The Continental Oil Co.'s No. 1 Wells is showing a little oil with considerable water. The Vacuum Oil Co.'s No. 1 State is pumping 111 bbls. of oil and the Midwest Refining Co.'s No. 31 Capps in the Hobbs district has been completed as an 850-bbl. well. In Eddy County interest is centered in four wells in the West Maljamar district which are showing for producers, the best one being Flynn, Welch & Yates' No. 2 Gissler, flowing 120 bbls. a day while drilling. The Pittsburg Oil Co.'s No. 1 McAdoo, in De Baca County, is being abandoned.

WYOMING

The Producers & Refiners Corp.'s No. 8, NE cor. NW, Section 7-26-89, on the Wertz Dome in Carbon County, was completed at 4,150 feet with an open flow capacity of 80,000,000 feet. The completion probably was in the Sundance sand. This well was started in 1927 as a test to the Sundance sand. Rotary rig and equipment were used and a string of 2,296 feet of 15½-inch casing was run. This is believed to be the longest string of that size pipe ever put into a hole in Wyoming. The sands in the Dakota formation are producing gas on this structure but no test has previously been drilled below that horizon. At 3,718 feet the well made 69,000,000 feet of gas in the Lakota sand. This flow was killed to drill deeper.

The Carter Oil Co.'s No. 2 State, SW cor., Section 16-48-82, Billy Creek Dome in Johnson County, is pumping more than 500 bbls. a day from the Frontier at a total depth of 3,240 feet. This structure has about 12 big gas wells in the Frontier and some of these wells have sprays of oil. Efforts have been made to drill through the gas in hopes of getting oil in the Dakota sands. The oil in No. 2 State, which is down structure and half a mile east of the nearest gasser, was a heavy black oil testing 20 degrees gravity when it was first encountered last winter, but reports have not yet been received as to whether pumping has resulted in any change in its quality.

McPherson and others' No. 1, NW cor. SW, section 2-44-96, Little Sand Draw structure in Hot Springs County, has been abandoned at 3,427 feet after penetrating the Frontier series and finding only water. The Ohio Oil Co.'s No. 1 Easton, SW NE, Sectioin 33-56-97, Byron Dome, Big Horn County, was completed as a gas well at 2,616 feet with an open flow capacity of 6,000,000 feet. It may be drilled deeper later on.

No. 1 Dykeman a Surprise

The Kinney-Coastal Oil Co.'s No. 1 Dykeman, SE SW Section 22-3n-1w, on the Pilot Butte Dome in Fremont County, proved to be a surprise this week when it was opened up and found to have gradually filled with oil. It made a small flow and is now standing full of oil. This field is a producer from shallow sands and the Dykeman well was started as a test to the Sundance regardless of what might be found in horizons above that formation. It cut a streak of sandy shale near the base of the Mowry at 3,319-42 feet which showed for about 1,000,000 feet of gas and 30 bbls. of oil on a test. The gas increased and the oil decreased while the test was in progress. The oil tests about 47 degrees gravity. The well was shut down at 3,358 feet to wait for special casing ordered from the factory. The hole is believed to be bottomed about 100 feet above the Muddy, the first sand in the Dakota series.

In the Sand Draw Field the Producers & Refiners Corp.'s No. 2, Section 9-32-95, is bottomed at 3,762 feet and is to be made into a water well.

In Carbon County, the Producers & Refiners' No. 1, NE NE Section 24-25-89, which was abandoned at a total depth of 3,477 feet as an oil test, is being shut in as a water well. It had a tremendous flow of water, one of the largest found in southern Wyoming, and it may be sold to stockmen.

Starting on Greenville Dome

This company is starting another well on the Grenville Dome in its No. 3, Section 28-21-86, which is spudding at 65 feet. No. 2, same section, is shut down at 435 feet with the tools in the hole. The same company's No. 7, Section 7-26-89, Wertz Dome, which came in for 40,000,000 feet of gas at a total depth of 3,658 feet, is tearing down tools after going back into the hole and deepening it to 3,688 feet. The Pacific American Oil Co.'s No. 1, SW SW, Section 32-25-89, Bull Springs, is drilling in the Lewis shale at 425 feet and carrying the 8¼-inch, and the Red Feather Oil Co.'s No. 1, SW SW Section 35-13-92, Baggs Dome, is drilling at 1,107 feet and carrying the 10-inch.

In Sweetwater County, the Mountain Fuel Supply Co.'s No. 1 Otto Arnold, NE Section 24-19-104, Middle Baxter Basin, is plugging back at 3,526 feet to shut off bottom water in the Sundance and will be made into a gas well. It made 8,000,000 feet before plugging began and is expected to be about a 4,000,000-foot gasser when finished. The Hidden Treasure Oil Co.'s No. 1, SW cor. Section 32-21-103, North Baxter Basin, is drilling at 600 feet.

In Uinta County, P. L. Cooper's No. 1, Section 19-18-117, La Salle district, is drilling at 1,200 feet. It had water in the Frontier at 1,085 feet. E. L. Doheny and others' No. 1, C SE Section 6-14-118, Spring Valley, is drilling at 2,368 feet with the 6¼-inch at 2,364 feet. Minton and others, SW SW Section 8-18-116, Cumberland district, are drilling at 1,281 feet in the Bear River and underreaming the 4¾-inch.

The Midwest Refining Co.'s No. 1 Little Grays River, SE Section 25-37-117, Lincoln County, is drilling in white water sand at 1,502 feet.

NEW MEXICO

The Midwest Refining Co.'s No. 22 Gregory, NW SE SW Section 31-25-37, in the Jal district, southeastern New Mexico, is drilling in lime at 3,315 feet with 300 feet of oil and 50 feet of water in the drill pipe. This well had 70,000,000 feet of gas at 3,071 feet, at which depth the change-over to rotary tools took place. It had more gas, 6,000,000 feet, at 3,165 feet.

The Gypsy Oil Co.'s No. 1 Humphreys, NW cor. SW Section 25-25-36, an offset on the east to the Skelly Oil Co.'s No. 1 Joyner, which was running structurally higher than the Joyner well and which everybody expected to be a producer, is being plugged to abandon at a total depth of 3,550 feet. It had the first water at 3,385-4,000 feet, below the Skelly pay, and at 3,550 feet it was flowing over the top and making 4,000 bbls. of sulphur water per day.

The Continental Oil Co.'s No. 1 Wells, SE NE Section 11-25-36, is drilling at 3,527 feet and does not look encouraging. It topped a break at 3,475 feet, which made 59 bbls. of oil and 4 bailers of water. The water increased upon drilling deeper and on August 12 it made 366 bbls. of fluid, of which 85 per cent was water. This well is 1½ miles north of Cranfill & Reynolds' No. 1 Wilson, the nearest producer. The Humble Oil & Refining Co.'s No. 1-B Lindley, C SE SE Section 14-25-36, is drilling at 495 feet in sand, and the Magnolia Petroleum Co.'s No. 1 Lindley, SE NE Section 26-25-36, is shut down in sand and shale at 2,355 feet for rig repairs. The Continental Oil Co.'s No. 1 McCallister, SW cor. SE Section 24-26-36, is drilling at 3,200 feet.

Temporary Completion

In the Hobbs district, the Midwest Refining Co.'s No. 31 Capps, SW cor. Section 3-19-38, has been cleaned out and temporarily completed at a total depth of 4,220 feet. It made around 850 bbls. a day initial and is about the same kind of well as the discovery, which it offsets on the northeast. The same company's No. 24 Leach, SE NW Section 15-19-38, is bottomed at 2,854 feet and is running the 10¾-inch to set and cement. The Ohio Oil Co.'s No. 1 State, SE SW Section 9-19-38, is drilling at 1,650 feet in anyhydrite, and Harry Walkers and others' No. 1 Terry, SW SE Section 10-19-38, is drilling at 3,730 feet in lime and anhydrite.

In the Eunice district, the Continental Oil Co.'s No. 1 William Meyer, SW cor. NW Section 28-22-36, is drilling at 1,500 feet in salt and anhydrite, and its No. 1 A. E. Meyer, SW SW Section 17-21-36, is drilling at 3,014 feet in hard gray lime. The top of the lime was at 2,995 feet. The Empire Gas & Fuel Co.'s No. 1 Closson, NW SE Section 6-22-36, previously reported a completion as a gas well, has been having trouble mudding off the gas due to a crevice into which more than 70 tons of mud was poured. An effort is being made to cement off the cave. Total depth is 3,542 feet. The well made 65,000,000 feet of gas before the mudding began.

No. 1 Flint Showing Water

The Continental Oil Co.'s No. 1 Flint, SE cor. Section 28-20-34, is standing at 3,770 feet at which depth it is showing a little water. Cranfill & Reynolds' No. 1-B State, NE cor. Section 2-21-33, is fishing for bit at 3,660 feet. Buell & Hagan's No. 1 State, C NE Section 33-11-35, Tatum district, is drilling at 1,900 feet in red rock, and the Ohio Oil Co.'s No. 1 McGeorge, SE NW Section 30-20-33, Pearl district, is drilling in lime at 3,275 feet. The Maljamar Oil & Gas Co.'s No. 2 Baish, NE cor. SW Section 21-17-32. Maljamar district, is shut down at 1,075 feet, and the Humble Oil & Refining Co.'s No. 1 Bowers, C NE SE

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HOME OIL GETS BIGGEST INITIAL OUTPUT IN TURNER VALLEY FIELD

By Victor Lauriston
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Aug. 24.—In the South Turner Valley Field, Home Oil Co.'s No. 3, LSD 14, Section 20-19-2w5, blew in this week at around 5,136 feet with the biggest initial production in the history of the field. The well started Monday morning with around 18,000,000 feet of wet gas which speedily increased to 30,000,000 or more. With partial crude naphtha recovery, the well on Wednesday made 1,000 bbls in 24 hours and it may make from 1,200 to 1,500 bbls. a day when the hole is cleared. At last reports it was still blowing lime fragments, necessitating frequent cleaning of the separators. Two separators were in use and a third was being connected. The flow was struck around 115 feet in the lime, somewhat higher in that formation than Home's Nos. 1 and 2 got their main production.

Home's No. 1 had a peak production of around 900 bbls. and an average of about 700, while Home's No. 2 has been making about 500 bbls. Home's No. 3 is the largest producing well drilled in Canada since the early Oil Springs gushers of 1862. Home's No. 3 was drilled to the lime with cable tools, and diamond drill was used to bring it in. About 7,000,000 feet of wet gas was encountered in the upper part of the lime. Home's No. 2, same LSD, was frozen off for 24 hours last week, but blew back into complete production.

Nine in the Lime

With Home's No. 3 in production, the Turner Valley Field has nine wells drilling in the lime and these may be brought into production at any time, while a tenth test, Foothills' No. 3, is thought to be near the top of the Madison.

In the central section of the field, Foothills Oil & Gas Co.'s No. 2, LSD 8, Section 1-20-3w5, is fishing for lost tools at 4,710 feet. This test is 353 feet in the lime, with an estimated flow of 9,000,000 feet, and potential crude naphtha recovery sufficient to make it a commercial producer.

In the south end of the field, North West-Associated's No. 1, LSD 6, Section 20-19-2w5, is sidetracking lost bit at 5,410 feet. This test also is practically in production. Foothills Oil & Gas Co.'s No. 3 (South West Petroleums), LSD 16, Section 8-19-2w5, after reaching 5,170 feet is cementing back to 4,800 feet to overcome caving in the Fernie shales.

In the central section of the Turner Valley Field, Calmont Oils' No. 1, LSD 2, Section 1-20-3w5, is reported making new hole around 5,535 feet. The gas flow has increased, and the well is blowing light crude over the derrick. The drill is still about 100 feet from the bottom of the original hole, which was cemented back to sidetrack lost tools. Work has

(Continued on Page 339)

Gas Turned Into San Francisco Line

California Oil Operators Busy Completing Preparations to Comply With Natural Gas Conservation Law August 31

By L. P. Stockman
Staff Correspondent, California Fields

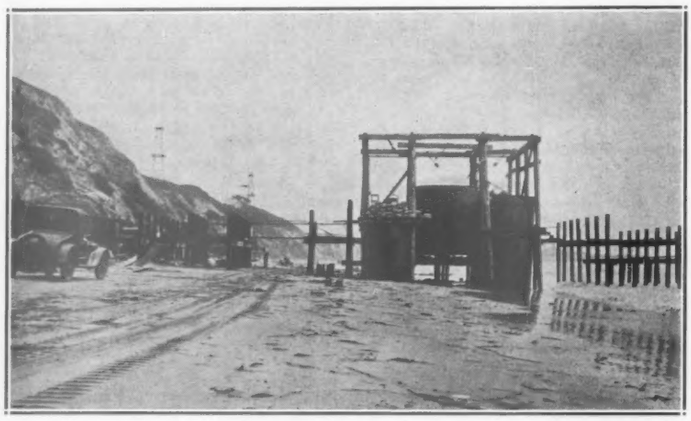
LOS ANGELES, Calif., Aug. 24.—The Milham Exploration Co. and the Pacific Gas & Electric Co. opened up a new industrial era for the San Francisco Bay region during the past week when the former completed connections with the latter's pipe line facilities and immediately started delivering Kettleman Hills natural gas for delivery in the northern part of the State. Present deliveries of natural gas by the Milham Exploration Co. from the Kettleman Hills Field approximate 40,000,000 feet daily but this will be later increased. The major transmission line of the Pacific Gas & Electric Co., which extends northward from the Buttonwillow gas field of Kern County to San Francisco, has a rated daily capacity of 100,000,000 feet and, while this installation will probably not be capable of handling the total production of natural gas expected to be developed in the Kettleman Hills Field within the next 30 days, it will nevertheless afford an outlet for a large quantity which would otherwise be blown into the air or held back because of the new gas conservation law. This line was originally laid for the purpose of transporting dry natural gas from the Buttonwillow gas field to San Francisco, but upon completion of the Milham's No. 1 Elliott, it was routed via Kettleman Hills in order to pick up surplus production from this area. The line from Buttonwillow northward to Kettleman Hills has not yet been completed as construction work was concentrated on the line north of Kettleman Hills in order to pick up at least a part of the 90,000,000 feet of natural gas which was being blown into the air in this area daily.

The status of the Buttonwillow gas field of Kern County where the Milham Exploration Co. has completed and shut in 10 wells capable of yielding approximately 60,000,000 feet daily, has not yet been determined. It is logical to assume that the Buttonwillow gas field will remain inoperative indefinitely in view of the excess production of natural gas being produced at Kettleman Hills but this remains to be seen.

Gas Conservation Law

With more than 625,000,000 feet of natural gas being blown into the air daily, operators in California are busily completing final preparations to facilitate compliance with the new gas conservation law which becomes effective at midnight, August 31. State officials are also ironing out all possible objectionable wrinkles and while no announcement has been made as to the method of procedure, a definite plan of action will probably be announced sometime during the coming week. As the dead line approaches, beyond which gas waste will not be permitted, operators are becoming more or less reconciled to the fact that the new gas law is an instrument of considerable potentiality. The recent announcement of F. G. Stevenot, director of natural resources, that no difficulty is expected to be encountered in the enforcement of the new law, has relieved the tension as it is quite evident that state officials do not expect to assume an arbitrary policy but will rather pursue a conservative but aggressive plan of action. This statement tends to indicate that while the gas conservation law will ultimately be extended to every area where a surplus production of natural gas exists, initial enforcement work will center on flush fields where gas waste is greatest.

The flush fields in California where surplus production of natural gas exists at the present time are Santa Fe Springs, Long Beach, Seal Beach, Ventura Avene, Elwood and Kettleman Hills. All are susceptible of regulation, except possibly Kettleman Hills where extremely high gas pressure renders the pinching back of production in some wells a rather hazardous undertaking. The Milham Exploration Co.'s discovery at Kettleman Hills, No. 1 Elliott, was at last reports producing 3,350 bbls. of crude oil and approximately 75,000,000 feet of natural gas daily. In conformity with the recent curtailment agreement between operators and the United States government an attempt will be made to reduce the gas pressure on the Milham's No. 1 Elliott in order that it might be safely shut in. This will be accomplished by completing three offsets, one of which, the Standard's No. 81, in Section 11-22-17, is already on production flowing 875 bbls. of crude oil and 20,000,000 feet of natural gas daily from 6,673 feet. The other two, No. 8 Elliott of the Marland Oil Co., in Section 12-22-17, and the Standard's No. 8 in Section 1-22-17, are down 6,790 feet and 6,205 feet, respectively.



Wharf under construction by Barnsdall and Rio Grande at Elwood in order to facilitate drilling operations in open ocean.

Elwood

Tideland drilling in the prolific Elwood Field of Santa Barbara County is rapidly becoming an important factor in field development and it is quite probable that several producing wells will be completed within the next 60 days. Tideland development was started in this field some two or three months ago but work has been rather slow in getting under way due to the extensive preliminary preparations which are necessary before actual spud can be made. It does not take very long to drill these shallow prolific wells in the Elwood Field but operators drilling out in the open ocean on tideland permits have been obliged to construct long wharves before rig construction can be undertaken. The Barnsdall recently completed two wharves extending out into the ocean for several hundred feet and rigs have already been erected for one new well on each wharf. One of these wharves is on tideland drilling permit No. 88 and the other on permit No. 94. The Bankline Oil Co.'s tideland drilling permit No. 99 has a frontage of approximately 1,500 feet along the Barnsdall's Bell Luton lease and preparations are being made to start rig construction in the very near future. The wharf under construction by the Bankline parallels the ocean front instead of projecting out into the open ocean at right angles. This company contemplates drilling eight wells on this permit and rig construction for the first well will probably get under way in the near future.

The Barnsdall has temporarily suspended all development work on land leases because of the competitive drilling by other companies out in the open ocean on tideland drilling permits fronting on the Bell Luton and Doty leases. In order to protect its holdings from drainage and at the same time participate in flush production the Barnsdall and Rio Grande have rigs going up for Nos. 9, 10 and 11 on the Bell Luton property along the ocean front within 100 feet of the tide line. No. 9 Bell will be an offset to the Bankline's first well which will be drilled out in the open ocean on tideland drilling permit 89. No. 10 Bell of the Barnsdall and Rio Grande will offset the Honolulu Consolidated's first well which will be drilled out in the ocean on tideland drilling permit No. 90. No. 11 Bell of the Barnsdall and Rio Grande will offset the Honolulu Consolidated's Mahoney well, which will be drilled out in the open ocean on permit No. 91. The Pacific Western Oil Co. has just resumed drilling operations on its first tideland drilling project following the landing of a string of 13-inch pipe at 2,107 feet. W. L. Appleford filed application a few days ago with the United States engineers' office for permission to construct a pier 1,500 feet long on tideland drilling permit No. 98, located in the extreme western part of the field.

While commenting on tideland development at Elwood, it might not be amiss to mention the fact that this work was made possible some time ago by the issuance of tideland drilling permits to various individuals. These permits cover acreage out in the open ocean beyond the high tide line, the property in question belonging to the state. The materials for wharves and piers constructed under these various tideland drilling permits were floated in from barges after being transported from Santa Barbara. This was made necessary because permittees holding tideland drilling permits did not have access from the shore line at Elwood. This has resulted in a rather interesting situation and the State of California has just instituted condemnation proceedings in the Santa Barbara courts to open a road from the state highway to the Elwood tidelands now under development. The proceedings, which were instituted by Attorney General U. S. Webb and Surveyor General W. S. Kingsbury are claimed to be absolutely necessary in order to protect the state's interest in royalty production resulting from tideland development. It is the intention of the state if successful to construct a road across the Bell Luton and Doty properties, which are under lease to the Barnsdall and Rio Grande. The opening of such a road from the state highway to the beach will enable the permittees who have been forced to bring in supplies on barges to carry on their respective projects with greater rapidity. This will become of paramount importance especially after production has been developed.

Santa Fe Springs

Completions at Santa Fe Springs were less numerous this week but a check indicates that about 12 wells should be finished in the deep zone within the next 10 days. One of the most important developments in the field is the increasing number of new wells getting under way for the Clarke zone or other deeper horizons. Practically every major company holding acreage on top of the structure is starting several new wells and a number of additional locations have also been staked. This deep zone development is

TANKER SHIPMENTS FROM LOS ANGELES TO ATLANTIC AND GULF COAST PORTS

Commodity—	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Crude oil	.....	.....	117,415	16,774	997,250	2,566,422
Fuel oil	.....	.....	.....	.....	49,950	111,621
Diesel and gas oil	.....	.....	150,892	21,556	1,210,934	1,298,602
Gasoline	254,564	36,366	507,443	72,492	13,486,828	8,662,777
Naphtha distillate	.....	.....	.....	.....	81,750	171,250
Coastwise—						
Crude oil	814,441	116,349	549,411	78,487	16,670,306	15,875,871
Fuel oil	311,885	44,555	206,181	29,454	13,450,000	10,969,645
Diesel and gas oil	7,336	1,048	15,083	2,155	764,388	754,020
Gasoline	342,409	48,916	192,090	27,441	7,329,547	5,570,073
Kerosene	14,464	2,066	8,573	1,225	62,619	52,884
Naphtha distillate	.....	.....	.....	.....	.....	171,566
Exports—						
Crude oil	188,908	26,987	197,811	28,259	3,821,756	1,470,832
Fuel oil	231,487	33,070	512,171	43,167	12,131,987	15,353,310
Diesel and gas oil	33,150	7,736	144,250	20,607	1,657,606	1,744,409
Gasoline	368,538	52,648	274,867	39,267	7,443,638	4,413,156
Kerosene	199,475	28,496	86,338	12,334	2,215,191	2,738,144

TANKER SHIPMENTS FROM SAN FRANCISCO TO ATLANTIC, GULF COAST PORTS

Diesel and gas oil	.....	.....	.....	.....	.....	342,425
Gasoline	81,050	11,579	81,560	11,651	1,427,552	1,357,567
Lubricants	69,534	9,933	.....	.....	138,706	277,151
Coastwise—						
Fuel oil	45,160	6,451	.....	.....	1,832,413	2,566,631
Diesel and gas oil	7,560	1,080	.....	.....	342,313	241,157
Gasoline	248,157	35,451	65,560	9,366	3,444,526	3,209,061
Kerosene	.....	.....	4,960	709	96,996	163,795
Exports—						
Crude oil	.....	.....	.....	.....	121,603	85,935
Fuel oil	.....	.....	.....	.....	529,011	1,677,939
Diesel and gas oil	.....	.....	58,380	8,340	213,854	10,400
Gasoline	.....	.....	127,550	18,221	3,716,870	3,124,323
Kerosene	.....	.....	5,033	719	387,450	392,263
Lubricants	.....	.....	1,214	173	23,113	11,400

PATRICK CARBON
for Diamond Core Drilling

Drilling for Production

THE recent successful applications of the Diamond Core Drill to production drilling—although a radical development of drilling practice—have vastly enlarged the field of usefulness of this efficient equipment.

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The Patrick Organization, although engaged exclusively in the distribution of Carbon (Black Diamonds), has been actively concerned for many years in assisting in the development of the Diamond Core Drill. By maintaining intimate contacts with actual drilling operations all over the world, this organization has been able to build up an exceedingly valuable experience in drilling that is freely available for the assistance of drillers everywhere. It is from this practical experience, applied to the grading, breaking, shaping and selection of Carbon for drillers' specific needs, that Patrick Carbon derives its drilling value. This is what is back of the Reliability that has made Patrick Carbon the standard wherever Quality Carbon is used.

Drillers and others interested are invited to communicate without obligation with the Patrick Research Department for further information on Diamond Core Drilling. Several interesting booklets, including "Diamond Core Drilling in Oil Field Practice," are available free upon request.

R. S. PATRICK
Duluth, Minnesota, U.S.A.
Cable Address, "Exploring" Duluth

not expected to become a very important factor until early next year although this deep zone production will continue to grow in importance as time goes on due to cumulative completions There has been a noticeable tendency during the past few weeks to change the objective of drilling wells and several which were originally scheduled to be finished in the O'Connell zone will be carried on down into the Clarke or Hathaway. The Shell is starting a flock of projected deep zone wells on the Golay and Slusher leases. Five rigs are already up on the former lease and three more on the latter. This is in addition to four already making hole. The Union Oil Co. has also started deep zone development with six rigs in course of construction followed by The Texas Company with foundations in for four new wells. The Texas Company topped the completion list this week by recompleting No. 3 Baldwin flowing 4,310 bbls. of unusually clean 34.3 gravity oil daily from 6,873 feet. George F. Getty's No. 30 Biddle, a new well, also showed substantial production as it came in flowing 3,670 bbls. daily from 7,018 feet. The Ambassador Petroleum successfully finished No. 13 Baker flowing 2,506 bbls. daily from 7,985 feet and the Richfield followed suit by recompleting No. 1 G. P. doing 2,440 bbls. per day from 6,959 feet. George F. Getty was getting along fine with his No. 18 and everything was set for early completion until the Wilshire's No. 2 Crawford drilled into the casing of the former at 2,000 feet and both began having trouble maintaining circulation. The Union Oil Co. heads the production list at Santa Fe Springs with a daily output of 64,000 bbls., followed by the General Petroleum with 55,000 bbls., The Texas Company with 40,000 bbls., George F. Getty with 26,000 bbls., Bandini Petroleum with 25,000 bbls. and the Standard with 15,000 bbls.

Long Beach

Several good wells have been finished in the Long Beach Field during the past week or 10 days and a number of others are scheduled to be completed within the next few days. T. J. (Tom) Cannon's second producer, No. 2 Hall Webber, in this field tanked 1,410 bbls. of 29.1 gravity oil during the initial 24-hour test upon completion in the deep zone. This new well was bottomed at 6,174 feet and finished with a 6⅝-inch liner carrying 876 feet of perforated. The Vanago Oil Co.'s No. 1 Signal also showed substantial production upon completion in the Miocene at 7,285 feet as it came in flowing 1,445 bbls. of clean 29.2 gravity oil and 2,000,000 feet of wet gas daily. This new well was finished with a 5¾-inch oil string carrying 970 feet of perforated which was landed at 7,270 feet and cemented through perforations at 6,300 feet. The Pan Cal Oil Co. started off the week by bringing in No. 6 Signal a new well doing 2,990 bbls. of clean 29.4 gravity oil and 3,225,000 feet of saturated gas daily. This project, which was carried down to 7,459 feet and finished with a 4¾-inch oil string carrying 862 feet of perforated and cemented through perforations at 6,597 feet, is flowing through a 1½-inch bean under a pressure of 470 pounds. The Dabney-Johnston Oil Corp., with 16 strings of tools to its credit and a current daily production of 13,500 bbls., successfully finished No. 23 Signal, a new well flowing 1,545 bbls. of unusually clean 29.4 gravity oil from 7,344 feet. Nos. 13 and 33, which were given preliminary production tests late last week from 7,433 feet and 7,445 feet, respectively, have failed to clean up but will probably be permitted to continue on production indefinitely. The former is pumping 151 bbls. of fluid cutting 50 per cent, while the latter is flowing 795 bbls., cutting 30 per cent.

The Petroleum Securities added a new well to its list by bringing No. 1 Bixby in flowing 360 bbls. daily from the shallow zone at 4,806 feet, the hole being open below the 11¾-inch water string landed at 4,725 feet. The State Co., which completed No. 1 Sievers late last month flowing 2,380 bbls. daily from 6,819 feet, was unable to secure a satisfactory natural flow in No. 1 M. C. M. at 6,983 feet with the result that the hole has been plugged back to 5,390 feet, from which depth it is pumping 51 bbls. of 26.4 gravity oil daily. The Delaney Petroleum Co.'s No. 1 Rainbow, which was bottomed at 6,888 feet and finished with a 4¾-inch oil string cemented through perforations at 6,281 feet, likewise failed to register substantial production, although it is flowing by heads at the rate of 140 bbls. daily. The Shell Oil Co. has landed and cemented a string of 5¾-inch pipe in its deep test, No. 11 Nesa, at 9,144 feet and preparations are under way to drill out and resume work tomorrow. This well, which is being carried down as a conclusive deep test to determine possibility of developing commercial production below present producing horizons, was down 9,280 feet when the 5¾-inch was cemented with 150 sacks of high temperature cement. The Cal Mex Oil & Refining Co. has just completed No. 24 Marine at 5,327 feet after finishing the hole with a 3-inch liner carrying 367 feet of perforated. Production figures are not yet available owing to the fact that the first 24-hour gauge has not yet been completed, but based on the first two-hour flow it looks good for approximately 1,000 bbls. per day.

Seal Beach

Two wells were put on production tests in the Seal Beach Field during the past week but neither of them showed substantial production. The Associated's No. 11 Bryant, which has been redrilled and deepened to 5,495 feet, was returned to production pumping 180 bbls. daily, but since the output is cutting in excess of 25 per cent, further work will probably be undertaken. The Marland is preparing No. 18 Selover and No. 28 Bixby for early completion and these two wells are scheduled to be followed into production by four more on these two leases within the next few weeks. The Standard, running three strings of tools on the San Gabriel lease, will probably also chalk up one or more completions within the next few weeks. George F. Getty failed to secure commercial production in No. 4 Lambert, a former upper zone producer in the Alamitos Heights town lot section in the deep zone at 6,153 feet as the initial output upon recompletion, 60 bbls. daily, is cutting approximately 75 per cent. The Texas Company, which is carrying No. 1 Alamitos on down for a deep conclusive test in the Alamitos Heigths area, was rotating ahead a few days ago at 6,075 feet with a string of 9-inch landed and cemented at 4,653 feet.

Richfield

The Superior Oil Co., which successfully completed No. 1 Guarantee in the Richfield district flowing 210 bbls. daily from 4,341 feet two weeks ago, has just completed No. 2 Guarantee, another new well doing 215 bbls. daily from 4,284 feet. No. 3 Guarantee on the same lease passed the 2,000-foot level a few days ago and looks good for completion some time within the next three weeks. The Continental Oil Co. is also expected to chalk up one or more completions in this field within the next 30 days. It has been more than a month since a new well has been finished in the Rosecrans Field but a check indicates the probability that two projects should be completed in this district within the next few weeks. The Union failed to secure satisfactory commercial production upon completing No. 11 Rosecrans several days ago at 5,615 feet as the initial output, 195 bbls. daily, was cutting approximately 50 per cent. This well is being drilled by stages and should be back on production again soon as it was killed for further work shortly after the preliminary test just made. No. 10 Rosecrans of the Barnsdall and No. 31 Marine of the Sunset Pacific Oil Co. are all considered potential producers. The Shell's No. 1 Barkdall pulled a funny one at Lawndale a few days ago when it suddenly blew in flowing 275 bbls. of clean 29.5 gravity oil. Drilling operations were suspended on August 1 as the crew could not seem to effect a satisfactory water shut off even after plugging back from 5,895 feet to 5,880 feet. After flowing for 24 hours No. 1 Barkdall died again and will probably remain inactive until another accumulation of oil and gas collects at the bottom of the hole. Eight wells are on production in the Lawndale Field at present with field production aggregating 1,450 bbls. daily.

Huntington Beach

Drilling operations in the Huntington Beach Field of Los Angeles Basin have shown a consistent increase during the past few weeks and several additional

(Continued on Page 68)

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Company, well, location—	S-T-R	Depth	Status
Standard, No. 5-9 Saticoy, Ventura Co.	10- 2-22	7,590	hd. sd. drilling
American Oil Co., No. 1 Camarillo, Ventura Co.	33- 2-20	1,208	suspended
Bolsa Chica, No. 1-A Temescal, Ventura Co.	4- 4-18	755	br. sh. drilling
Associated, No. 1 Rincon, Ventura Co.	19- 4-24	.....	grading
Miley, E. J., No. 2 Red Mountain, Ventura Co.	7- 3-23	1,690	hd. sd. drilling
Shell, No. 1 Simi, Ventura Co.	31- 3-17	3,525	fishing
Continental, No. 1 Sulphur Mountain, Ventura Co.	21- 4-22	3,765	suspended
Continental, No. 2 Sulphur Mountain, Ventura Co.	22- 4-22	6,740	suspended
Continental, No. 3 Sulphur Mountain, Ventura Co.	21- 4-22	2,265	br. sh. drilling
Lockwood Oil Co., Well No. 1, Ventura Co.	28- 8-21	290	sd. sh. drilling
Milham Explth., No. 1-A Buttonwillow, Kern Co.	8-28-23	4,662	gas well, idle
Milham Explth., No. 2 Buttonwillow, Kern Co.	8-28-23	2,730	gas well, idle
Milham Explth., No. 3 Buttonwillow, Kern Co.	8-28-23	2,694	gas well, idle
Milham Explth., No. 4 Buttonwillow, Kern Co.	6-28-23	2,670	gas well, idle
Milham Explth., No. 5 Buttonwillow, Kern Co.	5-28-23	2,500	gas well, idle
Milham Explth., No. 6 Buttonwillow, Kern Co.	8-28-23	2,676	gas well, idle
Milham Explth., No. 7 Buttonwillow, Kern Co.	6-28-23	2,720	suspended
Milham Explth., No. 8-A Buttonwillow, Kern Co.	8-28-23	2,673	gas well, idle
Milham Explth., No. 9 Buttonwillow, Kern Co.	8-28-23	2,400	deep test
Milham Explth., No. 10 Buttonwillow, Kern Co.	8-28-23	2,672	suspended
Lincoln Drlg. Co., No. 1 Buttonwillow, Kern Co.	6-28-23	190	suspended
Richfield Oil Co., No. 1 Semitropic, Kern Co.	36-27-23	7,618	suspended
Elmer Oil Co., No. 1 Bena, Kern Co.	15-30-30	3,000	resume work
Elmer Oil Co., No. 1-A Rosedale, Kern Co.	33-29-26	4,040	sd. sh. drilling
Taft Drlg. Co., No. 1 Union Avenue, Kern Co.	2-30-27	4,505	suspended
The Texas Company, No. 1 Edison, Kern Co.	23-29-29	.....	grading
Symark Oil Co., No. 1 Edison, Kern Co.	24-29-29	1,440	hd. sd. drilling
Heyd, Frank, No. 1 Edison, Kern Co.	26-29-28	.....	material
Shell Oil Co., No. 1 Lerdo, Kern Co.	5-29-27	4,190	recemented
General Pet., No. 1 McFarland, Kern Co.	25-26-25	6,100	br. sh. drilling
Union, No. 2 San Emidio, Kern Co.	5-10-21	3,670	suspended
Currency Pet. Co., No. 1 Jacalitos, Fresno Co.	28-21-14	2,302	rebuild rig
Curreny Pet. Co., No. 2 Jacalitos, Fresno Co.	14-21-14	350	suspended
Hornaday & Huggins, No. 1 Kerman, Fresno Co.	32-14-18	4,030	sd. sh. drilling
Shell, No. 2 Westhaven, Fresno Co.	26-19-18	2,707	will deepen
Shell, No. 6 Westhaven, Fresno Co.	6-20-18	1,910	abandoned
Shell, No. 7 Westhaven, Fresno Co.	6-20-18	1,120	survey hole
Cates Oil Co., No. 1 Joaquin Ridge, Fresno Co.	7-19-15	114	suspended
Oceanside Oil Co., No. 1 Krayenhagan, Fresno Co.	33-22-17	738	suspended
Petroleum Securities, No. 1 Huron, Fresno Co.	20-20-16	695	suspended
Petroleum Securities, No. 2 Huron, Fresno Co.	28-20-16	5,360	sd. sh. drilling
Rio Grande, No. 1 Kerman, Fresno Co.	14-13-17	.....	location
Pismo Dome Oil Co., No. 1 Pismo, San Luis Obispo Co.	5-32-13	1,120	cleaning out
Union, No. 1 Huasna, San Luis Obispo Co.	34-32-15	3,750	br. sh. drilling
Union, No. 1 North Huasna, San Luis Obispo Co.	12-32-14	3,925	br. sh. drilling
Midwest Refining Co., No. 1 Huasna, San Luis Obispo Co.	34-31-15	2,025	fishing
Panorama Oil Co., Well No. 1, San Luis Obispo Co.	7-31-21	4,010	fishing
Paso Robles Synd., No. 1 Paso Robles, San Luis Obispo Co.	27-27-11	2,842	br. sh. drilling
Shell, No. 5 Guadalupe, Santa Barbara Co.	36-10-35	2,305	hd. sd. drilling
Shell, No. 6 Guadalupe, Santa Barbara Co.	26-10-35	215	sd. drilling
Petroleum Securities, No. 1 Goleta, Santa Barbara Co.	.....	4,211	sd. sh. drilling
Union, No. 1 Buel Canyon, Santa Barbara Co.	X- 7-31	1,806	br. sh. drilling
O'Neil, L. B., No. 1 Los Alamos, Santa Barbara Co.	26- 8-33	3,265	sd. sh. drilling
Western Gulf, No. 1 Gaviota, Santa Barbara Co.	X- 5-33	3,612	sd. sh. drilling
Richfield, No. 1 Point Conception, Santa Barbara Co.	X- 5-35	.....	location
Standard, No. 1 Point Conception, Santa Barbara Co.	X- 5-34	2,428	idle, litigation
Standard, No. 1 Point Arguello, Santa Barbara Co.	35- 6-36	620	sd. sh. drilling
Gaviota Oil Co., No. 1 Lompoc, Santa Barbara Co.	9- 7-35	102	sd. drilling
Barnsdall, No. 3 Goleta, Santa Barbara Co.	1- 4-30	2,518	sd. sh. drilling
General Pet., No. 1 Goleta, Santa Barbara Co.	21- 4-28	4,533	50 bbls. daily
General Pet., No. 1 Orella, Santa Barbara Co.	5- 4-30	588	sd. sh. drilling
Shell, No. 1 Orella, Santa Barbara Co.	36- 5-31	5,600	sd. sh. drilling
Pacific Western, No. 1 Naples, Santa Barbara Co.	7- 4-29	3,960	fishing
System Oil Co., No. 1 Orcutt, Santa Barbara Co.	36-10-34	4,275	set pipe
Keystone Oil Co., No. 1 Santa Maria, Santa Barbara Co.	33-10-34	1,411	sd. sh. drilling
Wildcat Oil Co., No. 1 Santa Maria, Santa Barbara Co.	20-10-35	1,620	sd. sh. drilling
Keystone Oil Co., No. 1 Surf, Santa Barbara Co.	18- 7-35	2,360	sd. sh. drilling
Channel Oil Co., Well No. 1, Santa Barbara Co.	29- 4-27	6,304	suspended
Channel Oil Co., No. 1 Fellowship, Santa Barbara Co.	29- 4-27	1,640	sespe, drilling
Pacific Western, No. 1 Gibralter, Santa Barbara Co.	14- 5-27	.....	grading
Continental, No. 1 Carpenteria, Santa Barbara Co.	33- 4-25	4,130	gas well
Continental, No. 2 Carpenteria, Santa Barbara Co.	33- 4-25	4,580	rebuild rig
Colusa Oil Co., Well No. 1, Colusa Co.	31-15- 4	625	hd. sd. drilling
North Counties Oil Co., Well No. 2, Humboldt Co.	36- 2- 1	2,205	suspended
Humboldt Oil Co., Well No. 1, Humboldt Co.	6- 2- 1	3,041	suspended
Applegate & Renahaw, Well No. 1, Merced Co.	24- 6-10	3,760	suspended
Kuhns, H. L., Well No. 1, Merced Co.	8-12-19	660	suspended
Foster & Hammil, Well No. 1, Alameda Co.	21- 3- 3	1,148	hd. sd. drilling
Calhoma Oil Co., No. 1 Livermore, Alameda Co.	9- 3- 3	1,549	suspended
Shell, No. 1 Dudley, Monterey Co.	15-22- 9	3,765	testing
Union, No. 1 San Lucas, Monterey Co.	8-22- 8	1,560	fishing
Standard, No. 1 King City, Monterey Co.	23-22- 7	516	sd. sh. drilling
Marland, No. 1 Bradley, Monterey Co.	32-24-11	5,955	suspended
Tuck Oil Co., No. 1 Los Gatos, Santa Clara Co.	15- 8- 1	852	suspended
Pet. Sec., No. 1 Rich Grove, Tulare Co.	22-24-27	1,711	hd. sd. drilling
Dudley Ridge Synd., No. 1 Tulare, Kings Co.	12-23-19	1,305	gas, shut in
Porter, H. B., No. 1 Devils Den, Kings Co.	9-24-17	230	sd. drilling
O'Donnell, J. E., No. 1 Tulare, Kings Co.	7-23-20	Rig	suspended
Associates Pet., No. 1 Lewis Creek, San Benito Co.	5-19-10	501	suspended
Twin States Oil Co., No. 1 Soldani, Mendocino Co.	14-12- 7	700	hd. sd. drilling

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

The Texas Company, No. 1 Clearwater, Los Angeles Co.	8- 4-12	4,760	sd. sh. drilling
Standard, No. 1 Hawthorne, Los Angeles Co.	5- 3-14	6,895	gr. sd. drilling
Hummel, Joseph, No. 1 Redondo, Los Angeles Co.	28- 3-14	.....	location
Ohio Oil Co., No. 1 Del Rey, Los Angeles Co.	21- 2-15	3,651	hd. sd. drilling
Jackson, R. W., No. 1 Whittier, Los Angeles Co.	19- 2-11	1,447	recemented
Burlingham Pet. Co., No. 1 Compton, Los Angeles Co.	17- 3-13	2,204	suspended
Lee & Brainerd, No. 1 Rosecrans, Los Angeles Co.	17- 3-13	Rig	suspended
Johnson, D. W., No. 1 Compton, Los Angeles Co.	21- 3-13	.....	foundation
Hanners, George, No. 1 Watts, Los Angeles Co.	8- 3-13	Rig	rigging up
Jackson, R. B., No. 1 Watts, Los Angeles Co.	8- 3-13	Rig	suspended
Calif. Well Drlg. Co., No. 1 Compton, Los Angeles	11- 4-13	7,662	fishing
Hansen, N. J., No. 1 Watson, Los Angeles Co.	17- 4-13	Rig	suspended
Pugh Miller Drlg. Co., No. 1 Calabasas, Los Angeles Co.	6- 1-17	2,550	suspended
Russell Oil Co., No. 2 Jouhgin, Los Angeles Co.	25- 3-17	2,030	br. sh. drilling
Pomona Oil Co., Well No. 1, Los Angeles Co.	32- 1- 8	1,220	set pipe
Anchor Oil Co., No. 1 Puente, Los Angeles Co.	19- 2-10	4,820	suspended
Rucker, R. C., No. 1 Puente, Los Angeles Co.	27- 2-10	2,180	gr. sd. drilling
Urmi Oil Co., No. 1 Puente, Los Angeles Co.	31- 2- 8	775	redrilling
Prairie Oil Co., No. 1 Montebello, Los Angeles Co.	32- 1-12	5,191	gr. sd. drilling
Monterey Park, No. 1 Jepson, Los Angeles Co.	25- 1-12	5,096	gr. sd. drilling
West, L. M., No. 1 El Monte, Los Angeles Co.	16- 1-11	633	fishing
Union Oil Co., No. 1 Richfield, Los Angeles Co.	13- 3- 9	820	hd. sd. drilling
Southwestern Drlg. Co., No. 1 Richfield, Los Angeles Co.	21- 3- 9	5,777	cleaning out
Superior Oil Co., No. 1 Atwood, Los Angeles Co.	4- 4- 9	Mtl.	building rig
Queen, J. M., No. 1 Newhall, Los Angeles Co.	22- 3-16	230	suspended
Anderson, F. B., No. 1 Hasley Canyon, Los Angeles Co.	1- 3-16	567	oil sand
So. Calif. Drlg. Co., No. 1 Newhall, Los Angeles Co.	13- 3-16	1,384	cemented
Shell, No. 1 Coyote, Orange Co.	28- 3-10	5,030	sd. sh. drilling
Beard, G. F., No. 1 Brea Canyon, Orange Co.	30- 2- 9	930	suspended
Mesa Pet., No. 1 Newport, Orange Co.	21- 6-10	4,895	suspended
Oil Well Eng. Co., No. 1 Newport, Orange Co.	21- 6-10	2,805	cemented
Hall Pet. Co., No. 1-A Murrietta, Riverside Co.	23- 7- 3	Rig	suspended
Hemet Pet. Co., No. 1 Ward, Riverside Co.	9- 5- 1	3,398	hd. sd. drilling
Imperial Valley Oil Co., Well No. 1, Imperial Co.	32-11-10	2,980	suspended
Davenport O. & G. Co., No. 1 San Marcos, San Diego Co.	30-12- 8	847	suspended
Turner, S. S., No. 1 Escondido, San Diego Co.	25-12- 2	2,045	sd. sh. drilling

Fisher's Oil Area May Be Enlarged

Cranfill & Reynolds Completion in That County Opens Possibility That District 4 Miles to the North May Be Productive

By L. E. Bredberg
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Aug. 26.—Likelihood of an addition to the producing area in Fisher County, promise of another extension in Glasscock County, salt water in the Schleicher County test of the Phillips Petroleum Co., and eccentricities of the Taylor-Link area in Pecos County, were features in West Texas during the last seven days. There was a big drop in production and possibility that the Glasscock-Howard County Pools will be taken off proration.

Amerada and Roeser & Pendleton's No. 1 Haught, located in Section 81, Block 1, B.B.B.&C. Survey, northeastern Fisher County, which showed up for a new pool opener a week ago, has been put on pump and looks good for about 150 bbls. daily from the Fisher County pay horizon, Steele lime at 3,119 (steel line measurement). As yet no pumping gauge has been made owing to the fact that it was put on the pump the last day only, but it swabbed better than 5 bbls. per hour on a several hour's swabbing test, and did not swab down. Consequently it looks like a fairly good well, and it will bring forth other tests in this new area, although Amerada and Roeser & Pendleton have the surrounding acreage leased, and may go slow on developing it. Companies in the vicinity, however, may test their acreage.

Cranfill & Reynolds completed their No. 1 Flannigan, 4 miles to the south of the No. 1 Haught, 990 feet from the south and west lines of Section 200, Block 1, B.B.B.&C. Survey, making a 286-bbl. well in 18 hours from the same lime pay from 3,117½-20 feet. This well is a mile northeast of the nearest production and opens up the possibility that the 4 miles separating it from the Amerada and Roeser & Pendleton wildcat will prove to be producing area. These are two of the most interesting wells opened in this district, and tests on the acreage between them will be closely watched. The oil in this area is of a high gravity and sweet.

Irion in Producing Class

Irion County helped to pull itself up into the producing class this week when its second well was shut down for storage, there being no pipe line into the new area which was opened by the Brown & Fox's No. 1 Tankersley a few weeks ago. There likely will be a line run from the two wells to a loading rack at a point on the Santa Fe (Orient) Railroad a short distance to the west.

This second well in the Tankersley area belongs to the Banner Oil Co., formerly owned by Webb and others, and is located on the Nutt farm in Subdivision No. 5, Gonzales County School Lands. It topped the sand formation at 1,359 feet and was shut down at 1,362 feet with 800 feet of oil in the hole. It was to be put on the pump at once. If the well shows up well after a few days of pumping, the high gravity of this sweet oil no doubt will result in bids being made for the production from the two wells. Companies hesitated running a line to the first well, for it would have involved heavy expense, and they probably figured that the production might decrease from day to day, and that the one well did not warrant the expenditure of a gathering line.

The Kingwood Oil Co.'s No. 1 Suggs in Section 19, Block 1, H.&T.C. Survey, in Irion County, is also showing up a little better, for it encountered an increase in gas at 7,656 feet. It is now shut down at 7,667 feet to reinforce the derrick, and run 5 3/16-inch casing to the bottom.

Schleicher County is gradually convalescing from a vast lease play brought on by the showings in the Phillips Petroleum Co.'s No. 1 Whitten in Section 35, Block LL, and companies that spent over $100 per acre for several pieces of land are no doubt feeling the results of a buying "hangover," although this acreage may pay for itself when it is properly tested.

The wildcat test looked good for a well last week, but deeper drilling encountered salt water at 4,939 feet, the water gradually increasing with depth, until at present there is over 4,600 feet in the hole, the well drilling below 4,987 feet at the last report, in hard lime. The 6-inch casing will probably be reamed down to shut off the water, and the hole carried on down to an indefinite depth if trouble is not encountered in some fashion. The first pay was struck at 4,110 feet with an increase at 4,147 feet. It made 5 bbls. of oil and 3 bbls. of salt water from behind the pipe at this depth. The largest and last pay encountered was at 4,925 feet. Here the hole slopped over when 6-inch casing was run to 4,915 feet. Gravity of the oil tested 35 degrees. After the casing was run the well was swabbed, yielding 65 bbls., but swabbing dry. Drilling was resumed after this test was made, and the salt water encountered putting a rather discouraging aspect on the area.

Surprises in Taylor-Link Pool

The Taylor-Link Pool, Pecos County, has been a big surprise since the discovery of the first well, with practically all the tests in the pool causing astonishment. Landreth's No. 1 University, southwest of the discovery, startled observers with better than 62,000,000 feet of gas from the shallow depth of 950 feet, and Moncrief's No. 1 University was another surprise when it got a big gas showing at 915 feet. The Taylor-Link's No. 2 University, south of the discovery, got an oil showing at 925 feet and produced over 200 bbls. from that depth until it was cased off and the well drilled deeper and was completed for an initial production of 1,553 bbls. at a total depth of 1,631 feet after topping the deep pay at 1,616 feet. Top of the lime was 1,405 feet and elevation 2,519 feet.

Moncrief's No. 1 University, west of the discovery, ran 50 feet higher on the surface and most persons thought it would make a large well, but at present it is shut down at 1,668 feet with a hole full of oil, estimated good for only about 100 bbls. daily. Top of the second pay was 1,535 feet with the lime topped at 1,330 feet, and the surface elevation running 2,560 feet. It will probably be plugged back to 1,575 feet, with a possible shot to test the pay formation at that point.

The latest surprise is in the World Oil Co.'s No. 1 University in the NE of Section 13, just southwest of the discovery. It passed up the shallow pays found in the Moncrief and Taylor-Link's No. 2, and is drilling below 1,015 feet with no showings of oil, but a slight amount of gas from 785-90 feet. Surface elevation is 2,525 feet. Another test of the Tidal Oil Co., 3 miles to the northwest in Section 17, Block 18, is being abandoned at 1,716 feet, after encountering 25 bbls. of sulphur water from 1,580-92 feet. Its No. 1, a mile to the west, was abandoned at 1,602 feet. Top of the lime of that test was 1,270 feet.

Taylor-Link's No. 1 University, the discovery well, is reported to have drooped to about 85 bbls. daily, and there is a possibility that the company will deepen to test the pay, in the hope of making as good a well as the No. 2, the south offset. Deepening may help the well, but one guess is as good as another.

There is a rumor that this area may be put on proration, in order to cut down an orgy of drilling, and if proration does go into effect, one line is expected to be enough to handle the output.

No. 1-E Yates Deepened

The Mid-Kansas and Transcontinental Oil Co. deepened their No. 1-E Yates, located in the western part of Section 59, Block 1, I.&G.N. Survey, from the former depth of 1,066 feet. The first pay was encountered at 1,055 feet and the well produced 125 bbls. in 12 hours, but deepening started it flowing at a great increase, and while drilling at 1,110 feet it gauged 420 bbls. in 12 hours through a 4-inch line. The increase came from 1,082-90 feet.

These companies completed a splendid well on their Yates "H" lease in Section 32, Block 194, G.C.&S.F. Survey, Pecos County, when their No. 10-H topped the pay at 1,625 feet and was shut down for storage at 1,680 feet. It flowed 1,804 bbls.

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WILDCAT OPERATIONS IN WEST TEXAS

Week Ended August 19

Company, farm and location—	Remarks—
ANDREWS COUNTY	
Deep Rock's No. 1 Ogden, 2,310 ft. E, 330 ft. S, Sec. 6, Blk. A-46, Public School Land	Cellar and moving on ground.
BORDEN COUNTY	
Louisiana Oil & Ref. Co.'s No. 1 Miller, 1,320 ft. from W and 150 ft. from S line, Sec. 355, Blk. 97, H.&T.C.	Building rig.
Moncrief et al's No. 1 Munger, C of SW Sec. 14, Blk. 31	Drlg. 405 ft.
Teas & Wheeler's No. 1 Long, 1,320 ft. N and E of Sec. 27, Blk. 30, T.&P. Sur.	Top salt 1,030 ft.; drlg. 2,125 ft.
BREWSTER COUNTY	
E. W. Bateman et al's No. 2 Nevill, 2,000 ft. S and W line of Sec. 62, Blk. 13, G.H.&S.A.R.R. Sur.	Drlg. 1,670 ft.
Brewster Oil Co.'s No. 1 fee, 2,640 ft. S and 2,598 ft. E of NW cor. Sec. 45, Blk. G-15, G.C.&S.F.	Fishing 1,935 ft.
Cowden & Bowser's No. 1-A Jackson & Harmon, Sec. 1, Blk. 331, T.C.R.R. Sur.	Set 8-in. 1,530 ft.; shut down 2,000 ft.
Forrest Oil Co.'s No. 1 Skinner, C SW SE Sec. 100, Blk. 2, G.C.&S.F. Sur.	Straightening crooked hole 430 ft.
J. M. Hickey's No. 1 Jackson & Harmon, NE cor. Sec. 182, Blk. 9, G.H.&S.A. Sur.	Shut down 2,000 ft.
Johnson & Weekley's No. 1 Jackson & Harmon, C Sec. 104, Blk. 10, G.H.&S.A. Sur.	Drlg. 2,735 ft.
Van McPhail's No. 1 McIntyre, SE cor. Sec. 59, Blk. 352, 7 mi. S of Alpine	Shut down 1,740 ft.
COKE COUNTY	
Lipan Oil Co.'s No. 1 E. C. Rawlings, Sec. 390, Blk. 1-A, H.&T.C. Sur., elev. 2,750 ft.	Drlg. 2,892 ft.
Mid-Kansas Oil Co.'s No. 1 W. E. Lackey, 330 ft. N and E of SW cor. Sec. 272, Blk. 1-A, H.&T.C.	Pay 3,755-56 ft.; 6⅝-in. casing set 3,451 ft.; drlg. 3,995 ft.
Ray E. McCamey et al's No. 1 McCutcheon, 2,300 ft. S and 785 ft. W of NE cor. of T. J. Hines Sur. No. 4	Shut down 3,520 ft.
CONCHO COUNTY	
Duffy et al's No. 1 Gilliam, 1,320 ft. N and 1,120 ft. W of SE cor. Sec. 21, Blk. 10, H.&T.C.R.R.	Spudded and shut down.
Jones & Leiner's No. 1 Jones, 420 ft. S and 15 ft. E of NW cor. John G. Reh Sur. No. 1,378	Top lime 1,770 ft.; top pay 1,775-80 ft.; 18 ft. oil in hole; to test; shut down 2,375 ft.
Turner et al's No. 1 Borsig, 150 ft. from S of SE cor. G. Emig Sur. 130, 6 miles west of Paint Rock	Shut down 735 ft.
CRANE COUNTY	
Gulf Prod. Co.'s No. 67 McElroy, 2,102 ft. S and 2,640 ft. W of NE cor. Sec. 201, Blk. F, C.C.S.D. &R.G.N.G.R.R.	Spudding.
Gulf Prod. Co.'s No. 68 McElroy, 771 ft. S of NE cor. on east line of their lease in Sec. 200, Blk. F, C.C.S.D.&R.G.N.G.	Location.
Gulf Prod. Co.'s No. 7 Waddell, Sec. 10, Blk. B-23, 2,640 ft. from S, 330 ft. from W	Top salt 1,108 ft.; slight show gas 2,285 ft.; 1,000,000 ft. gas at 3,065 ft.; top lime 2,972 ft.; total depth 3,610 ft.; plugged back to 3,420 ft.; preparing to pump.
Gulf Prod. Co.'s No. 8 Waddell, 330 ft. N and W of SE cor. Sec. 2, Blk. B-24, school land	Drlg. 595 ft.
Simms-Atlantic No. 10-A University, 2,310 ft. S and E Sec. 39, Blk. 30, Univ.	Drlg. 1,406 ft.; top salt 1,070 ft.
Simms-Atlantic's No. 2-F University, Sec. 45, Blk. 30, 2,310 ft. from N, 330 ft. from E. University	Location.
Tidal Oil Co.'s No. 10 University, 859 ft. from W and 1,255 ft. from S line of SE Sec. 47, Blk. 30, University Land	Building rig.
T. P. Coal & Oil Co.'s No. 2 University, 2,310 ft. from S, 1,650 ft. from W Sec. 34, Blk. 30, University Land	Location.
Church-Weekly's No. 3 Dowell-University, 990 ft. from S and W Sec. 39, Blk. 30	1,500 ft. oil in hole; top pay 2,890 ft.; fishing 3,025 ft.
CROCKETT COUNTY	
Eppenaur et al's No. 2 Noelke, 500 ft. N and 1,350 ft. E of SE cor. Sec. 64, Blk. 1, I.&G.N.R.R. Sur.	Shut down 1,120 ft.; top salt 720 ft.
Lewis & Daniels' No. 1 Pecos River Bed, 19 yards S and 27 degrees E of NW cor. Sec. 33, Blk. 1, I.&G.N. Sur.	Shut down 1,135 ft.
W. W. Donnelly & Young's No. 1 Shannon, SW SW SE Sec. 42, Blk. BB, T.C.R.R. Sur.	Drlg. 2,200 ft.
W. W. Donnelly & Young's No. 1 Middlebuster, C Sec. 11, Blk. 9, D.&S.E. Sur.	7,000,000 ft. gas at 1,663 ft.; shut down 1,755 ft.
Moncrief's No. 3 Todd, 330 ft. from S and E Sec. 29, Blk. VV	Rigging up.
Taylor-Link's No. 3 Powell, 1,000 ft. S of No. 2, Sec. 53, Blk. BB, E.L.&R.R. Sur.	Fishing 2,285 ft.
CULBERSON COUNTY	
Deep Rock Oil Co.'s No. 2 Kioh, 380 ft. N and 1,388 ft. W Sec. 39, Blk. 59	Drlg. 1,500 ft. (corrected).

(Continued on Page 331)

Gray County Operators Curb Output

Curtailment Measures Adopted Owing to the Fact That Pipe Lines Are Overloaded and Available Storage Is Full

By L. E. Bredberg
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Aug. 26.—Agreement to shut down wells in the top of the pay in the main producing areas in Gray County to curb overproduction in that section of Texas, another disappointment in the Tarver area of Foard County, and an extension to the northeast in the Bryson Pool, Jack County, were the main events of the Panhandle and Wichita Falls districts for the week. Another good well in the Morris Pool continued interest in Coleman County. Stephens County received a jar when Edward W. Bateman's No. 1 Manning was shot with 2,000 quarts of nitro on August 25.

Operators in Gray County met at Pampa, Tex., on August 23 and decided to shut down possible producers on top of the granite wash pay formation, due to the fact that pipe lines are overloaded at present, and that available storage is full. They also agreed that wells now producing, but slumping in production should not be deepened for the present, as many have been done in the last few weeks, raising their production averages many barrels per day. All this was brought on by the weekly gain in Gray County production, advancing from 22,000 bbls. to 97,000 bbls. daily average during the last four months, setting a new peak in production practically every week, until production reached such a high point that the operators were experiencing difficulty in disposing of their crude to pipe line companies and purchasers.

This difficulty curtailed drilling operations to a great extent, for the operators could not see any advantage in drilling wells and having no possible chance to dispose of their production, consequently shut down on staking locations, building rigs and drilling their tests. The Humble, Prairie, Texas, Gulf and Magnolia are the pipe line companies trying to give relief to this area, but they are all running to capacity, carrying their sister companies' oil and heavy deliveries of controlled oil, consequently cannot give aid to all needing outlets for their production.

Many Big Wells

Gray County has witnessed many remarkably large wells completed during the last four months, all of them helping materially to swell the daily average from week to week, and to add to this gain many other wells which had been slumping off in production to an appreciable extent have been deepened and increased, in many cases, to exceedingly large wells.

The Tarver area of Foard County received another disappointment this week when the Wichtex Oil Co. and others' No. 1 Johnson was abandoned as a dry hole at 2,140 feet after encountering only a rainbow showing of oil at 2,045 feet. Sandy lime was struck from 2,008-17 and 2,023-44 feet, and the well was shot with 20 quarts, but with no results.

Jack County retains its place among the interesting sections each week by new and interesting developments, and this week a northeastern extension of the Bryson Pool seemed to be a fact. This discovery is located in the northern part of the M. Main Survey, approximately 1½ miles northeast of the main Bryson Pool, or about 1 mile east of the Leidecker extension well. It topped the pay from 3,136-41 feet, and looked good for an estimated 150 bbls. daily. Total depth is 3,141 feet, and next week will give more facts about the well, probably proving its real character. This opens up new territory for drilling in this pool, and will help to increase interest in it.

Biggest Shot in State

What is said to be the biggest shot ever put off in Texas was timed at 9:36 Sunday morning in the Ed W. Bateman's No. 1 Manning, located in the E half SW, Section 42, Block 4, T.&P. Survey, Stephens County. The shot consisted of 2,000 quarts of nitroglycerin, and a time bomb, set and shot by Jack Rapp, an old-time oil well shooter of Breckenridge, and he said he believed it to be the largest shot ever made in the State. Total depth of the well was 3,328 feet. It previously had been shot with 500 quarts from 3,180-3,328 feet with no results, and this last big shot was made from 3,180-3,328 feet, expecting to break up the lime for about 1,000 feet in each direction. After the shot, which bridged the hole, the tools were run in and a few licks made, but accumulated gas and pressure shot the tools out of the hole, partly wrecking the derrick and causing a few days' shutdown for rebuilding the rig and cleaning up the debris.

About 200,000 feet of gas showed after the shot, but after about 15 minutes this subsided to about 50,000 feet. It is believed that the hole is partly bridged and after rebuilding the rig and cleaning out the well will be tested. It is on an 80-acre lease owned by Bateman and others. They also have the western offset 80 acres under lease. Ten-inch casing is the only string in the hole. It is set at 1,535 feet.

The South Plains Pipe Line Co. has made location in Section 45, Block 2, A.B.&M. Survey, Potter County, for a stripping plant for gas going through their line to Lubbock and Midland, Tex. It is to be a Tulsa type of two units with oil absorption, and about 35,000,000 feet per day capacity.

To Build Gasoline Plant

The Cockrell-McIlroy Co. is to build a 20,000,000-foot capacity gasoline plant in the S half NE Survey 50, Block 25, H.&G.N. Survey. It is to be a Southwestern type, two units, oil absorption with two 165 horsepower Bessemer engines and compressors and four 165 horsepower Clark engines and compressors. The gas is to be secured from the Shamrock Oil Co.'s Clayton leases and Chapman leases and is possible that some outside gas will be used, but as yet no contracts have been made. Disposition of the gasoline is to be made through a 10-mile 2-inch welded line from the plant to McLain, Tex.

The States Oil Corp., C. O. Moore and the Humble Oil & Refining Co. repressured their D. C. Woolridge leases on March 26, 1929. Each lease has one key well, with an average of 40,000 feet at 80 pounds pressure. Production did not show any great increase in this Cross Cut sand horizon in the Fry Pool, Brown County. Production for five months is as follows:

	States Oil Corp. (bbls.)	C. O. Moore (bbls.)	Humble O. & R. Co. (bbls.)
March	15	7	8
April	15	8	8
May	13	7	9
June	16	10	8
July	16	7	8

The Eastland Oil Co. completed a good well in its No. 11-A Morris in the Morris Pool, Coleman County. It came in with an initial production of 750 bbls., while the company's No. 8-A Morris made only 31 bbls. initial production. The White Eagle Oil & Refining Co. completed its No. 5 Morris in Section 25, William Webber Survey, for an initial production of 615 bbls. from sand encountered from 2,026-37 feet.

It is interesting to note that the Amerada Petroleum Corp. plugged its Nos. 16, 23, 24 and 11 J. H. Fry, and The Texas Company plugged its Nos. 3, 5, 7, 8, 11, 12 and 29 Pugh in the Fry Pool, Brown County. The Midwest Exploration Co. plugged its No. 4 E. F. George in the Byler Pool.

Archer County

Guy Baggett's No. 2 Kinder was temporarily abandoned at 1,303½ feet. L. T. Burns' No. 2 Wilson was dry and abandoned at 1,504 feet. King-Corlett & White's No. 1 Wilson was dry and abandoned at 1,550 feet. Estacabo Oil Co. and others' No. 6 Prideaux had an initial production of 5 bbls. at 652-62½ feet. Humble and Fain-McGaha's No. 4 Logan had an initial production of 18 bbls. at 1,141-49 feet. The Texas Company and Burns' No. 1 Ward was dry and abandoned at 1,265 feet.

Clay County

Mid-Continent Oil & Gas Co.'s No. 5 Stines had an initial production of 20 bbls. at 1,760-81 feet. Wirt Franklin's No. 1 Wolf was dry and abandoned at 3,135 feet.

Cooke County

Danciger's No. 2 Huggins had an initial production of 310 bbls. at 1,137-74 feet. Their No. 4 Huggins had an initial production of 280 bbls. at 1,093-1,133 feet. Fain-McGaha's No. 2 Huggins had an initial production of 100 bbls. at 1,126-63 feet. Their No. 3 Huggins had an initial production of 70 bbls. oil and 20 bbls. salt water at 1,145-53 feet. Humble Oil & Refining Co.'s No.

(Continued on Page 68)

WILDCAT OPERATIONS IN TEXAS PANHANDLE

Week Ending August 26

CARSON COUNTY

Company, well, farm, name, section and block—	Remarks—
Baber and Shell Pet. Corp.'s No. 1 Percival, 330 ft. S and W, NE cor. E½ SE, Sec. 199, Blk. 3, I.&G.N. Sur.	Location.
Champlin Ref. Co.'s No. 4 McConnell, 990 ft. S and 330 ft. E, NW W½ NW, Sec. 67, Blk. 4, I.&G.N.R.R. Sur.	Drlg. 1,020 ft.
Danciger O. & R. Co.'s No. 1 Block, 330 from N and E lines, Sec. 112, Blk. 4, I.&G.N. Sur.	Location.
Delmar Oil Co.'s No. 5 Noel, 330 ft. S and W, NE cor. W½ SE, Sec. 198, Blk. 3, I.&G.N. Sur.	Drlg. 1,700 ft.
Empire G. & F. Co.'s No. 19 Burnett, C SE, Sec. 89, Blk. 5, I.&G.N.R.R. Sur.	Rig on ground.
Empire G. & F. Co.'s No. 1 M. P. Co. "C," 330 ft. N and W, SE cor. NW, Sec. 108, Blk. 4, I.&G.N.R.R. Sur.	Drlg. 1,404 ft.
Empire G. & F. Co.'s No. 2 Deahl, 660 ft. N and E, SW, Sec. 3, Blk. 5, B.&B. Sur.	Location.
Empire G. & F. Co.'s No. 1 Fuqua, 330 ft. N and W, SE cor. NW, Sec. 17, Blk. 3, A.B.&M. Sur.	Rigging up.
Empire G. & F. Co.'s No. 2 M. P. Co. (Lane), C NE, Sec. 62, Blk. 4, I.&G.N.R.R. Sur.	Spudding.
Empire G. & F. Co.'s No. 1 Deahl, 660 ft. from S and W lines, Sec. 3, Blk. 5, B.&B. Sur.	Ran 10-in. csg. at 965 ft.
Gulf Prod. Co.'s No. 1 Garner-B, 330 ft. N and W SE cor. SW, Sec. 106, Blk. 4, I.&G.N.R.R. Sur.	Estimated 7,000,000 ft. gas; S.D. 3,090 ft; 15,000,000 ft. gas.
Gulf Prod. Co.'s No. 3 Cooper, 330 ft. S and 990 ft. W, NE cor. SW, Sec. 5, Blk. 9, I.&G.N.R.R. Sur.	Drlg. 1,700 ft.
Gulf Prod. Co.'s No. 4 Cooper 330 ft. S and E, NW SW, Sec. 5, Blk. 9, I.&G.N.R.R. Sur.	Spudding.
Gulf Prod. Co.'s No. 7 Noel, 330 ft. S and W NE cor. SW, Sec. 198, Blk. 3, I.&G.N. Sur.	S.O. 3,180-84 ft; S.D. 3,235 ft; swbng. 12½ bbls. per hr.
Herragan Oil Co.'s No. 1 L. C. McConnell, 330 ft. N and W line W½ SW, Sec. 187, Blk. 3, I.&G.N. Sur.	Drlg. 2,908 ft; S.G. 2,780 ft; increase from 2,860-2,908 ft.
Magnolia Pet. Co.'s No. 7 fee, 990 ft. from W line, 890 ft. from S line SE, Sec. 91, Blk. 4, I.&G.N. Sur.	S.D. 2,675 ft; show gas 2,655 ft.
Midwest Explin. Co.'s No. 3 Cooper, 990 ft. S and 330 ft. E NW cor. W½ NW, Sec. 5, Blk. 9, I.&G.N. R.R. Sur.	T.D. 3,121 ft; swbd. 170 bbls. first 20 hrs. from 3,040-55 ft. and 3,065-95 ft.
Midwest Explin. Co.'s No. 4 Cooper, 330 ft. N and E, SW cor. W½ NW, Sec. 5, Blk. 9, I.&G.N. Sur.	Fishing 280 ft.
Osborne et als' No. 2 Percival, 330 ft. N and W, SE cor. E½ NE, Sec. 199, Blk. 3, I.&G.N. Sur.	Drlg. 2,436 ft.
Prairie O. & G. Co.'s No. 2 Nail, 330 ft. from N and W lines of N½ E½ SE, Sec. 198, Blk. 3, I.&G.N. Sur.	Drlg. 500 ft.
Reynolds et als' No. 2 Cooper, 330 ft. from S and W lines, E½ NW, Sec. 5, Blk. 9, I.&G.N. Sur.	Rigged up.
Ryan Cons. Oil Co.'s No. 5 Block, 330 ft. N and W, SE cor. NE, Sec. 111, Blk. 4, I.&G.N. Sur.	Rigged up.
Ryan Cons. Oil Co.'s No. 6 Block, 330 ft. S, 990 ft. E, NW NE, Sec. 111, Blk. 4, I.&G.N. Sur.	Building rig.
Skelly Oil Co.'s No. 18 Schafer, 990 ft. S and 355 ft. W, NE, Sec. 66, Blk. 4, I.&G.N. Sur.	Drlg. 1,830 ft.
Skelly Oil Co.'s No. 19 Schafer, 330 ft. N, 990 ft. E, SW cor. NE, Sec. 198, Blk. 3, I.&G.N. Sur.	T.D. 1,200 ft; cmtng. 10-in. csg.
Skelly Oil Co.'s No. 20 Schafer, 330 ft. N, 990 ft. W, SE cor. N½, Sec. 198, Blk. 3, I.&G.N. Sur.	Rigging up.
Skelly Oil Co.'s No. 21 Schafer, 340 ft. N, 1,540 ft. W, SE cor. SE, Sec. 66, Blk. 4, I.&G.N.R.R. Sur.	Location.
Stubblefield's et als' No. 1 Garner, 330 ft. from S and E lines SE, Sec. 104, Blk. 4	Drlg. 2,000 ft.
Timmis et als' No. 2 Garner, 330 ft. from N line and 330 ft. from E line SW SW, Sec. 113, Blk. 4, I.&G.N.	T.D. 3,132 ft; T.P. 3,099 ft; I.P. 50 bbls; shot 90 qts. 3,112-32 ft; C.O. and swbd. 50 bbls. first 24 hrs.

CASTRO COUNTY

Colorado O. & R. Co.'s No. 1 M. Slemmons, SW cor. Sec. 73, Blk. M-17, B.S.&F. Sur.	Rig blown down.
Mystery Oil Co.'s No. 1 J. I. Crum, SE cor. NE, Sec. 333, Blk. M-6, S.K.&K. Sur.	S.D. 510 ft. for csg.

CHILDRESS COUNTY

C. L. Sloane et als' No. 1 B. P. Smith, Sur. 49, F. P. Knott lands	S.D. 4,486 ft.

COCHRAN COUNTY

Continental Oil Co.'s No. 1 Slaughter-A, 330 ft. from W and 430 ft. from S lines, League 130, Carson County School land	S.D. 4,580 ft.

COTTLE COUNTY

Explin. Co.'s No. 1 Richards	1,000,000 ft. gas 3,730-30 ft; S.D. 4,000 ft.
Explin. Co.'s No. 3 Matador Land & Cattle Co., C, Sec. 46, J. H. Stephens Sur.	Drlg. 3,600 ft.
Sun Oil Co.'s No. 1 T. B. Yarborough, 495 ft. S and 2,460 ft. E NW cor. Sec. 551 Blk. H. W.&N.W. Sur.	Fishing tools 4,450 ft.

(Continued on Page 328)

VALLEY CENTER KANSAS

EL DORADO KANSAS

McPHERSON KANSAS

HAYS KANSAS

MAUD OKLAHOMA

SEMINOLE OKLAHOMA

SASAKWA OKLAHOMA

TULSA OKLAHOMA

OKLAHOMA CITY OKLAHOMA

BIG SPRING TEXAS

BORGER TEXAS

PAMPA TEXAS

PYOTE TEXAS

TRENT TEXAS

SANTA RITA TEXAS

SMACKOVER ARKANSAS

CASPER WYOMING

PARCO WYOMING

CODY WYOMING

OKOTOKS, ALBERTA CANADA

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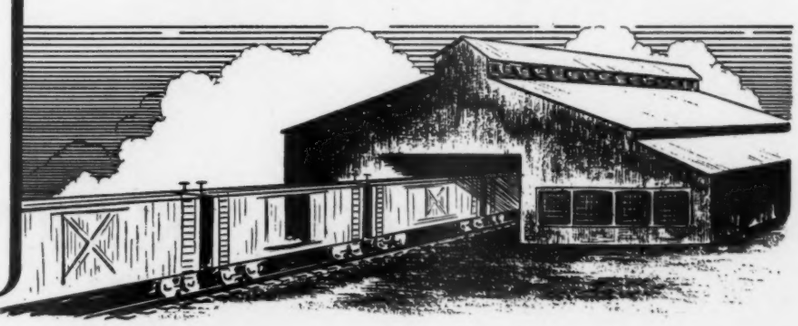
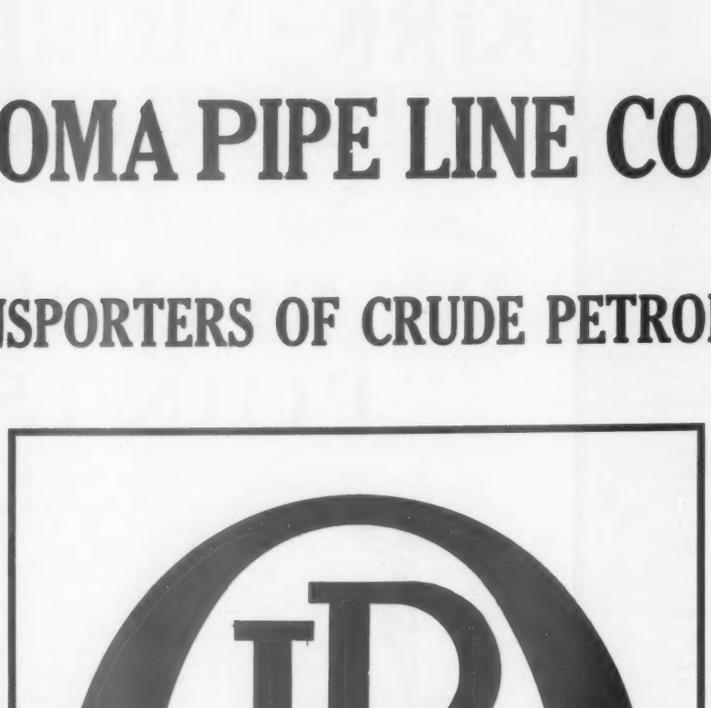


OKLAHOMA PIPE LINE COMPANY

TRANSPORTERS OF CRUDE PETROLEUM



MUSKOGEE, OKLAHOMA

Pipe Line Construction News

SURVEY FOR EXTENSION OF PIPE LINE FINISHED

Survey for an extension of Cities Service Gas Co.'s main pipe line system from Atchinson, Kans., to Falls City, Nebr., by way of Horton and Hiawatha, Kans., has been completed by Empire engineers. The route is staked and right of way maps are in preparation. The new line will be approximately 53 miles long and constructed of 6-inch pipe.

This is only one of many projects Cities Service Co. has in view to extend its main lines to points in this and other areas that do not at the present time enjoy the advantages of natural fuel.

From Ottawa junction north to the Topeka tap, a distance of 18 miles, the 16-inch main gas pipe line now in use will be reclaimed and a new 18-inch line laid. Also, 15 miles of the 12-inch pipe line from the Topeka tap toward the Kansas capital will be reclaimed and relaid with 16-inch pipe.

This is in line with the company's policy to annually recondition and reclaim its main lines, thus assuring satisfactory natural gas service.

The entire project, while extending the main pipe line system, will increase the potential deliveries of natural gas to Topeka, Lawrence, Leavenworth, Atchinson and other cities in northeast Kansas.

PIPE LINE PROJECT DELAYED

At least one major company subscribes to opinions recently expressed that the way to keep down production in the Oklahoma City Field is to hold off on pipe line construction. Sinclair Pipe Line Co. has announced that in order to benefit the oil situation as much as possible it will not immediately lay its proposed new pipe line into the Oklahoma City Field. The company, it is understood, will take the right of way and make all preliminary arrangements so that if it decides to lay the line later all the details will have been attended to. Oklahoma City operators have agreed to limit production in that field to the pipe line and tank car outlet.

SURVEYORS COMPLETE WORK

GLASGOW, Mont., Aug. 26.—Surveyors have completed the work of staking out the gas line which will supply Malta and Glasgow from the Bowdoin Field, and work of laying pipe will commence at once, according to advices from Saco. It is reported that the line to Malta will be 6-inch and the line to Glasgow 12 or 16-inch. This is one link in one proposed line to the Twin cities from northern Montana gas fields.

HUMBLE TO LAY LINE

The Humble Oil & Refining Co. will lay a 6-inch line to the Taylor-Link Pool in Pecos County from McCamey, a distance of about 18 miles, and probably contract for the production of the wells now completed. It is believed doubtful another company will run in a second line until the area has proven itself in need of more outlets.

GAS MAINS ARE ENLARGED

BILLINGS, Mont., Aug. 26.—The Billings Gas Co. has completed its work in enlarging the gas mains of the business section. Because of the increasing demands for service, it was necessary to replace the old 3½-inch mains with 6, 8 and 10-inch pipe. The work has been going on since April 25, and the improvement cost $15,000.

SMALL CHANGE SEEN IN DEMAND FOR PIPE, WITH OCCASIONAL BIG ORDER

By B. E. V. Luty

PITTSBURGH, Pa., Aug. 26.—The volume of tubular goods demand shows little change, with the exception of line pipe, which shows a big order now and then. Small orders, for a few miles at a time, are coming in. Oil country goods are dull in welded and moderately active in seamless. The tonnage is larger in seamless than in welded, but perhaps the number of wells using welded is the greater, seamless being used for the deep wells. Demand for standard or merchant pipe is approximately the same as a year ago, and demand in the year to date shows substantially no change.

Pipe mills are operating at about 60 per cent and seamless tube mills at about 70 per cent. Pipe mill operations are somewhat hegvier than in the second quarter, on account of more line pipe while seamless production is a shade lighter, on account of there being a little less boiler tube business. Mechanical tubing is off a trifle on account of decreasing automobile production since May.

Pipe prices are much steadier than they were early in the year, when there was shading by jobbers in various districts just as a matter of competition. Now the irregularities are confined to a few districts.

Little Falling Off in Steel Industry

In the steel industry as a whole there is scarcely any decrease in consumption, shipments and production. Order receipts have been running relatively light compared with the extreme activity early in the year, when buyers were fearful that they would not receive full deliveries, and in the last few weeks have been somewhat under the rate of shipping. This is perfectly natural in view of this being the height of the vacation season, while with buyers convinced that deliveries are easy, for the time being at least, and with some old orders still to be filled, they order as lightly as possible.

Buyers in general have been getting back to the hand-to-mouth policy which they had followed for about six years, with increasing closeness, up to early this year. As the steel industry thrived under that policy its reappearance is no catastrophe though it does seem to be a trifle disconcerting to some observers.

Steel production is at close to actual capacity. The best estimate seems to be that it is off between 5 and 10 per cent this month from the peak rate of all time, which was shown last May. There is no laxness in production, so far as can be seen, except on the part of some of the small mills which have specialized output. Large mills, with less demand from the automobile trade, and making fewer rails than formerly, divert steel from one finishing department to another and maintain steel production except where they have units off for repairs.

Production Expected to Slip

Without any precise basis, it is the common expectation that steel production will slip a trifle from month to month, because production since the middle of last year has been far above the general trend line. Until late last year the heaviest production of steel ingots in any period of 12 consecutive months was about 47,000,000 tons, in the 12 months through May, 1927. Production in the 12 months to end this month will be about 56,270,000 tons, or just 20 per cent increase in two years and three months, whereas in six years from 1920 to 1926 the total increase had been only 15 per cent, or 2 to 3 per cent a year.

Steel prices are holding their own now, following a little slipping in the last three months, about $2 a ton, in wire, wire nails, black sheets and galvanized sheets. Cold-rolled strip, which was being sold at concessions for several weeks, is firm again at old prices, 2.75 cents to 2.85 cents, but meanwhile consumers have become pretty well covered through the quarter.

The long uncertainty over billet and slab prices for the remainder of the quarter has been settled, the producers gaining their point with a price of $35, Pittsburgh or Youngstown, an advance of a dollar over the second quarter price. Sheet bars were established some time ago at $35 for this quarter, making no change. Thus the dollar differential is wiped out. Technically forging billets should be $5 over rolling billets, or $41, but the market seems to be quotable at $40 to $41.

CALGARY PIPE LINE

CHATHAM, Ontario, Aug. 26.—The Commercial Cartage Co. of Calgary has commenced work on the new oil pipe line for the Regal Oil & Refineries, Ltd., to run from the north end of the Turner Valley Field to the Regal refinery in Calgary. The right of way is being cleared and subcontracts for Jones & Laughlin pipe and Victaulic couplings have been let to Riverside Iron Works, Ltd., of Calgary. The line is to be completed by October 1.

OPENS CHICAGO OFFICE

The executive offices of the Missouri-Kansas Pipe Line Co. have been moved from Kansas City, Mo., to Chicago. W. T. Stevenson, secretary and treasurer of the Missouri-Kansas company, will be in charge of the Chicago office. The operating end of the company, however, will remain in Kansas City with B. R. Bay, vice president and general manager, in charge.

LINE TO SULLIVAN FINISHED

SAN ANTONIO, Tex., Aug. 26.—The Texas Company has completed its pipe line to Sullivan, 10 miles away on the Southern Pacific where it has a loading rack and is loading out oil. The report is out that The Texas Company is planning to extend its line still farther north to a connection with its main line from West Texas.

GAS LINE SURVEY UNDER WAY

GLASGOW, Mont., Aug. 26.—The survey for a gas line to connect the Big Dome gasser on the Bowdoin structure with the pipe line that will serve Malta and Glasgow is under way. Laying of the main line is expected to be completed by Christmas. The 16-inch line to Glasgow will be started as soon as the Malta line is completed.

LINE TO LEWISTOWN PLANNED

LEWISTOWN, Mont., Aug. 26.—The Northern States Oil Co., headed by Frank P. Book of Detroit, Mich., who is the principal owner of the Lewistown refinery, has made application through C. W Buntin, Lewistown attorney, for a franchise to supply Lewistown with gas from an unspecified source. The City Council fixed September 16 as the time for holding a special election to pass on the petition.

NEW GAS LINE TO CLOVIS

Clovis, N. Mex., having granted a franchise to the Pecos Valley Gas Co. for natural gas distribution, the survey is under way for a gas line to run from the Maljamar gas basin in the Artesia Field, Chaves County, to Clovis, 135 miles to the north. The Pecos Valley Gas Co. is constructing a line to Roswell, N. Mex. The company has a supply of 40,000,000 feet daily, and it asserts that the territory it holds will assure production for 50 years.

GULF COMPLETING ITS LINE

The Gulf Pipe Line Co. has completed the major portion of its 10-inch line from West Texas to Port Arthur. The line, to be 450 miles in length, has been delayed by heavy rains and floods, but is due to be in operation by the Middle of September. Three crews are at work upon the 100-mile stretch between Lufkin and Wortham, which is the only uncompleted portion at the present time. The new line will double the company's handling capacity and will allow the transportation of more than 50,000 bbls. daily.

HUMBLE SURVEYING NEW LINE

The Humble Pipe Line Co. is starting a survey for a 6-inch pipe line from McCamey, Tex., to the Taylor-Link Pool, 18 miles south in Pecos County. The Humble company has a refinery and large tank farm at McCamey, and trunk lines from Winkler County down through Crane and Upton Counties run through this place on to the company's Kemper pumping station where the crude is pumped through 10 and 12-inch lines to Ingleside Harbor. This new line will be the first outlet for the new Taylor-Link Pool, which now has three producing wells, and several drilling.

CHANGING FROM STEAM TO GAS

SHREVEPORT, La., Aug. 26.—Standard Pipe Line Co. is changing over from steam to gas power at the Kenova station on the Smackover-Mississippi River line. The new equipment consists of three units of 165-horsepower Bessemer twin gas engines direct connected to Prescott duplex 5 by 24 pumps with a rated capacity of 10,000 bbls. daily. Of the old equipment two pumps and four boilers will be held in reserve as emergency equipment, the boilers also furnishing steam for line heaters during cold weather.

GAS FOR FALLS CITY

Falls City, Neb., in the southeast corner of that State, only a few miles from the Kansas line, will be piped with natural gas by the Cities Service Co. The city council of Falls City recently granted the Gas Servive Co. a franchise to distribute natural gas in that city. Falls City will be on the line which will be built by the company from the end of its present system at Atchison, Kans., up through Horton and Hiawatha north to Falls City.

LINE TO SERVE 11 TOWNS

Construction of a 50-mile natural gas trunk pipe line of 8-inch diameter and 80 miles of 6-inch laterals from the Caddo Field of Louisiana to various towns of east Texas by the Arkansas Natural Gas Co. will be started soon. Eleven towns in Texas will be served by the new lines. Southern Cities Distributing Co., subsidiary of the Arkansas Natural Gas Co., has obtained franchises for distributing systems in all towns to be served.

OKLAHOMA FIELDS

(Continued from Page 47)

tion 17-14-4. The Prairie Oil & Gas Co. made location for No. 1 Curry, SE cor. NW SE, Section 8-14-4.

Muskogee County

E. Mills and others' No. 1 C. H. Jordan, SW cor. SE SE, Section 14-13-18, is spudding. H. D. Johnston and others' No. 1 S. Cowert, NE cor. SE NW, Section 23-13-18, is rigging up. John Aggas and others' No. 1 M. Wheat, SE cor. NE SW, Section 28-16-15, is rigging up.

H. D. Johnston and others' No. 1 Jordan, NW cor. NE, Section 23-13-18, has been completed for 1,000,000 feet of gas in sand 632-51 feet. E. Mills and others' No. 1 B. Kelly, CWL E half NW NW, Section 24-13-18, has been completed for 2,000,000 feet of gas in sand 513-34 feet. Babcock Brothers' No. 6 N. Barnett, SW cor. NW NE, Section 8-15-15, made 8 bbls. in sand 1,616-23 feet. J. R. Parks' No. 1 N. Lovett, CWL SE NW, Section 21-15-15, is dry and abandoned at 2,600 feet.

Noble County

Indian Territory Illuminating Oil Co.'s No. 1 McCormick, NE cor. SE, Section 33-21-1w, has been completed for 18,000,000 feet of gas in sand 3,365-72 feet. Sinclair Oil & Gas Co. is moving the material in for No. 1 Waltermire, NW cor. SE, Section 33-21-1w.

Oklahoma County

Coline Oil Co. made location for No. 3 Clauer, SE cor. Section 25-11-3w. Indian Territory Illuminating Oil Co. made location for No. 2 A. C. Anderson, NE cor. SE NE, Section 25-11-3w.

Okfuskee County

Champlin Oil & Refining Co. made location for No. 14 P. Jacobs, CEL SE SE, Section 15-11-11. Shell Petroleum Corp. & Sheldon Oil Co. moved the rig in for No. 1 Hopping, NE cor. SE, Section 21-12-11. Independent Oil & Gas Co. has the rig on the ground for No. 1 Wilson, SW cor. NW, Section 22-12-11. Producers & Refiners Corp.'s No. 1 Monarye, NW cor. NE SE, Section 29-12-10, is drilling deeper at 3,000 feet.

Pure Oil Co.'s No. 1 Jimboy, C NW NW Section 25-11-10, is dry and abandoned at 4,251 feet. E. W. Kimbley's No. 1 D. Barnett, NE cor. Section 13-11-11, has been abandoned at 2,970 feet. Mid-Continent Petroleum Corp.'s No. 2 D. Dindy "B," SE cor. SW NE, Section 31-11-11, has been completed for 55 bbls. in sand 3,027-64 feet. Champlin Oil & Refining Co.'s No. 1 Campbell, SE cor. NE SW, Section 29-12-10, has been completed for 147 bbls. in Cromwell sand, 2,895-3,231 feet after plugging back from Wilcox. C. M. Sheldon Oil Co.'s No. 1 Wilson, NW cor. SW, Section 22-12-11, has been completed for 180 bbls. in sand 2,721-25 feet.

Okmulgee County

Mechlin & Berlin's No. 7 V. Colbert, CWL SE NE, Section 14-14-14, is drilling at 1,400 feet. J. E. Wallace's No. 9 V. Colbert, NW cor. SW NE Section 14-14-14, is spudding. L. C. Wheeler and others made locations for No. 3 Fish, NW cor. SE NE, Section 6-15-12. Lavery and others' No. 1-A C. Rentie, CWL SW SW Section 11-15-14, is drilling at 250 feet.

L. M. Levine and others' No. 1 Holcomb, SW cor. NW SE, Section 24-14-12, is dry and abandoned at 2,010 feet. Jackson & Wise's No. 10 Adams, CWL SW SW Section 3-15-11, has been completed for 15 bbls. in Taneha sand 2,232-60 feet. L. C. Wheeler and others' No. 2 Fish, NE cor. Section 6-15-12, is dry and abandoned at 2,624 feet. W. B. Pine and others' No. 4 Bighead, CNL SE SE, Section 9-15-12, has been completed for 145 bbls. in Wilcox sand 2,625-54 feet. Devonian Oil Co.'s No. 1-A Chamberlain, SW cor. SE, Section 35-15-12, is dry and abandoned at 1,635 feet.

Pottawatomie County

Oklahoma Crude Oil Co. moved the rig in for No. 1 Asher Townsite, Block 65, NE cor. NW NW, Section 19-6-4. Indian Territory Illuminating Oil Co. has the cellar dug for No. 2 Weldfelt, NW cor. NE NW, Section 2-7-4, St. Louis Pool. Darby Petroleum Corp.'s No. 1 Bettis, SW cor. Section 21-7-4, is a cellar. The rig is on the ground for No. 1 Floyd, NW cor. SW SE, Section 22-7-4. Sunray Oil Corp. and others' No. 1 Bourbonnais, NE cor. Section 28-7-5, is a rig on the ground. Tidal Oil Co. and others made location for No. 1 Bulley, SW cor. NW, Section 3-8-4.

Sinclair Oil & Gas Co. & McGraw's No. 1 Kelly "A," NE cor. NW NE, Section 2-7-4, St. Louis Pool, flowed 1,450 bbls. from Wilcox sand 4,328-35 feet. Magnolia Petroleum Co.'s No. 2 M. Harden, NW cor. Section 12-7-4, made 324 bbls. from Hunton lime 3,769-3,895 feet. Independent Oil & Gas Co. & Westland Oil Co.'s No. 3 Rhodd, NE cor. NW NW, Section 16-7-4, swabbed 42 bbls. from Simpson sand 3,980-4,045 feet. Independent Oil & Gas Co.'s No. 1 James, NW cor. SE SW, Section 17-7-4, made 1,350 bbls. from Simpson sand at 4,106 feet. Magnolia Petroleum Co.'s No. 6 Wilbarn, NE cor. SW SE, Section 24-7-4, has been completed for 125 bbls. in Simpson sand 4,285-4,380 feet. Sinclair Oil & Gas Co.'s No. 6 Neeley, NE cor. SW SW, Section 25-7-4, had Simpson sand 4,180-4,210 feet and swabbed 370 bbls. Sinclair Oil & Gas Co. and Mid-Continent Petroleum Corp.'s No. 1 Cummings, SE cor. NE SE, Section 6-7-5, is dry and abandoned at 4,470 feet in Wilcox sand. Superior Oil Corp.'s No. 1 C. Jackson, SW cor. Section 36-8-4, was completed for 130 bbls. at 4,252 feet. No. 1 Songster, NW cor. Section 8-9-5, Earlsboro Pool, made 870 bbls. in Wilcox sand 4,379-91 feet.

Pontotoc County

Homaokla Oil Co.'s No. 4 Ritchie, NW cor. NE SE Section 1-4-7, drilled to 2,249 feet and plugged back to 2,140 feet where it swabbed 20 bbls. Independent Oil & Gas Co.'s No. 1 Hampton, NE cor. SE, Section 23-4-8, is dry and abandoned at 3,690 feet.

Osage County

Oklahoma Power & Water Co.'s No. 120 C SW Section 4-20-10, is drilling at 370 feet. Peters Petroleum Corp.'s No. 1 location has been made, NW cor. NE, Section 9-20-10. Kay County Gas Co. is building the rig for No. 8-B SE cor. NE SW Section 22-24-7. Indian Territory Illuminating Oil Co. made location for No. 417 CSL SW NW, Section 8-24-9. Location has been made for No. 419 SE cor. SW NW SE, Section 8-25-11. The machine is on the location for No. 414 NW cor. SE NW, Section 26-27-11. Location has been made for No. 416 SW cor. SE SE Section 35-29-10. Winona Oil Co. moved a machine in for No. 13 NW cor. SW SW Section 22-29-11.

W. D. Gray and others' No. 1 CNL NE Section 3-23-8, has been completed for 30 bbls. at 2,536 feet in Wilcox sand topped at 2,490 feet. McCune, Wormser and others' No. 2 C NE, Section 15-24-8, made 1,780 bbls. in Wilcox sand 2,655-56 feet. Peters Petroleum Corp. and Producers & Refiners Corp.'s No. 2 SW cor. SE SW Section 22-27-11, has been completed for 100 bbls. in Bartlesville sand 1,638-58 feet.

Seminole County

Sunray Oil Corp. made location for No. 1 Sunday, NW cor. SE, Section 25-5-5. Barnsdall Oil Co. has the rig up for No. 1 Lusty, SW cor. NE, Section 13-5-7. Carter Oil Co. made location for No. 5 Jackson, NE cor. NW NE, Section 11-7-6 Little River Pool. The Texas Company staked location for No. 2 Dindy, NW cor. NE SW, Section 24-7-6. Continental Oil Co. and Shaffer Oil & Refining Co. has the cellar dug for No. 5 Harris, SW cor. Section 4-7-7, East Little River Pool. Sinclair Oil & Gas Co. has the cellar dug for No. 6 Phillips, NE cor. SE SE, Section 5-7-7. Magnolia Petroleum Co. made location for No. 1 Naifer, SW cor. Section 18-7-7. Carter Oil Co. made location for No. 2 Community-Mayhue, SE cor. SW, Section 11-9-6. The Prairie Oil & Gas Co. made location for No. 3 Calkins, NE cor. NW SW, Section 17-9-6.

Blackwell Oil & Gas Co.'s No. 2 Fleet, SE cor. SW NW, Section 13-5-7, swabbed and flowed 1,450 bbls. from Wilcox sand 4,357-70 feet. Sinclair Oil & Gas Co.'s No. 1 T. Peter, SE cor. NW NW, Section 18-5-8 Allen Pool, an old well completed at 2,700 feet, set whipstock at 2,347 feet, drilled to 2,435 feet and flowed 225 bbls. Burke Greis Oil Co.'s No. 4 Lucy, NE cor. SE NE SE, Section 18-5-8, has been completed for 100 bbls. in Cromwell sand 2,550-2,650 feet. Gypsy Oil Co.'s No. 1 Thomas, SE cor. NW, Section 9-6-7, is dry and abandoned at 4,304 feet. No. 18 Cotcha, NW cor. SW Section 23-7-6 Little River Pool, made 662 bbls. in sand 3,096-3,129 feet. Carter Oil Co.'s No. 1 Rogers, SW cor. SE, Section 2-8-5 Carr City Pool, is a dry hole at 4,489 feet in Wilcox sand. Amerada Petroleum Corp.'s No. 1 Reed, SW cor. NW, Section 12-8-5, made 205 bbls. in Wilcox sand 4,281-87 feet. J. S. Cosden Inc.'s No. 1 Sarber, NE cor. SW SW, Section 13-9-5 Earlsboro Pool, has been completed for 69 bbls. in Wilcox sand 4,188-91 feet. The Prairie Oil & Gas Co.'s No. 1 Calkins, NW cor. SW, Section 17-9-6, made 6,380 bbls. in Wilcox sand 4,298-4,311 feet.

Gypsy Oil Co.'s No. 3 Green, NE SE Section 17-7-4 Pottawatomie County, which made about 6,000 bbls. of oil the first 24 hours from the Hunton lime, had declined to 1,475 bbls. on August 23 after producing for about 10 days from a total depth of 3,601-97 feet. It is still flowing naturally and no water is showing.

Failures in East Seminole

In the East Seminole Pool some failures were reported. Magnolia Petroleum Corp.'s No. 2 Coody, NW cor. NE SE Section 18-9-7 Seminole County, had Wilcox sand at 4,325-44 feet, where it filled up with water and was abandoned. Sinclair Oil & Gas Co.'s No. 1 Johnson, SE cor. NE NW Section 18-9-7, Seminole County, had water from 4,230-38 feet and was abandoned.

An Important Wildcat

A new wildcat test between the Oklahoma City Field and the Seminole area has been announced by Brownfield and others' No. 1 Higbie in the SE cor. NW Section 20-6-1e, Cleveland County. The test is located on a block of 3,200 acres. It is planned to test the Wilcox sand horizon. Several major companies have acreage in this area and on the south the Tidal Oil Co. recently completed two water wells in the Wilcox sand which were watched with a lot of interest on account of a general high structural condition in this area.

Good Well in 9-9

Burke-Greis Oil Co.'s No. 1 Oliphant, SE cor. NE NW Section 18-9-9 Hughes County, which was producing from the Gilcrease sand, has been deepened to the Cromwell sand and made a good well. It had been producing from the Gilcrease sand for more than a year after being originally started for a Wilcox sand test. The Cromwell sand was found at 3,486-87 feet, where it made 370 bbls. in 20 hours. The well is an extension to the production in that section where several dry holes have been completed. The same company has about 500 acres of leases around this well.

The only important sale of oil property was that of W. L. Umburn's Simmer lease in the E half NE Section 11-10-11 Okfuskee County, consisting of 100 acres and 8 producing wells making 154 bbls. daily to the Regal Oil & Gas Co. of Tulsa. The lease has seven wells producing from the Booch sand and one well in the Salt sand. The consideration was reported to be at $1,000 per barrel or $154,000. The lease has several undrilled locations.

The northwestern part of Oklahoma is still being leased by most of the major oil companies. Some large bonuses have been paid for leases in Logan County, northeast of the Oklahoma City Pool. The Shell Petroleum Corp. paid $30,000 for the NE quarter of Section 3-15-4w Logan County, which is in the extreme southwest part of that county.

Logan County Operations

L. H. Wentz' No. 2 Williams in Section 31-19-4w Logan County, which offsets J. S. Cosden's No. 1 Gardner, is running about the same geologically and according to the other wells in the field it looks favorable and many expect it to be as large a producer as the Cosden well which is still making 4,500 bbls. daily. The Amerada Petroleum Corp.'s No. 1 Clark in Section 17-29-4w Grant County, just south of the state line, is running lower on the structure than the Gypsy Oil Co.'s No. 1 Gibson which found water in the Wilcox sand at 4,868 feet. The Amerada Petroleum Corp.'s well is 128 feet lower on the same formations than the discovery well just over the state line in Sumner County, Kansas. It looks now as if all the oil production would be in Kansas and the dry holes in Oklahoma.

In the Southern Fields

Southern Oklahoma does not report any outstanding well but new locations are being made and leasing activities still continue. A new wildcat test will be made by the Twin State Oil Co. and others in the NE cor. SW Section 35-6s-4w in the southern part of Jefferson County. Mid-Tex Oil Co. will drill a test in the C NE NE NW Section 36-1s-6w Stephens County, on a block of leases in Sections 25 and 36. Amerada Petroleum Corp.'s No. 1 Delana, SE NW NW Section 31-4s-9w, Cotton County, has been abandoned at a total depth of 3,355 feet, in granite wash. McFain & McGaha's No. 1 Beck, NW cor. SW SW Section 29-4s-11w Cotton County, is drilling at 3,205 feet. This wildcat is expected to reach the pay horizon in the next 100 feet.

Greater Seminole Production

The gauges for the various pools in the Greater Seminole area on August 26 are as follows:

Pool—	Bbls.
Little River	78,548
Carr City	11,328
Maud	13,042
Mission	25,118
Bowlegs	32,687
Earlsboro	88,540
Seminole	33,443
East Seminole	7,879
Searight	12,531
Total Seminole Field	303,116
St. Louis	66,263
Asher	11,603
Sasakwa	6,573
Pearson	1,150
Total	388,705

Seminole Pipe Line Runs

The daily average pipe line runs from the Seminole Field for last week were as follows:

Company—	Bbls.
Barnsdall	4,970
Champlin	4,578
Continental	1,100
Consolidated	505
Cosden	9,521
Empire	9,518
Gulf	45,038
Independent	....
Magnolia	20,775
Oklahoma	57,657
Prairie	54,333
Producers & Refiners	2,038
Pure	7,305
Shaffer	2,625
Shell	10,381
Sinclair	29,811
Texas	17,063
Tidal	23,551
White Oak	3,139
Total	303,908
Tank Cars	9,897
Grand Total	313,805

The Indian Territory Illuminating Oil Co.'s No. 1 in the SW cor. NW NW Section 25-10-6, a wildcat on the east side of the Searight Pool, has found a hole full of water in the Hunton lime at 4,457 feet and is drilling ahead in Hunton at 4,515 feet.

The Independent Oil & Gas Co. will drill a wildcat well on the Olive structure in Section 20-18-8 Creek County. This township has had several Wilcox sand tests but only a few of these have had showings of oil. The township as yet has no Wilcox sand production.

The Prairie Oil & Gas Co.'s No. 11 Billington, NW cor. SW NW, Section 11-8-5 Carr City Pool, has been abandoned at 4,244 feet.

Stephens County

Denver & Wichita Falls Pipe Line Co. and McAlester's No. 6 Taliaferro, SE cor. NW SE, Section 28-1s-8w, is rigging up to deepen from 2,183 feet. Lone Eagle Oil Co.'s No. 14 Simpson, SE cor. NW SE, Section 34-1s-8w, is drilling at 850 feet. Heydrick and others' No. 3 Pool, SW cor. NW SW SW, Section 35-1s-8w, is drilling at 700 feet. Pace and others' No. 10 McMasters, NE cor. NW SE NE, Section 13-2s-8w, is drilling at 540 feet. Jenkins and others' No. 1 Bunch, NE

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cor. SW NE SW, Section 21-2s-7w, is rigging up.

Harris & McNeil's No. 1 Pettigrew, SE cor. SW, Section 11-2-5w, is making 5 bbls. from sand 1,454-57 feet. Winkler & McQueen's No. 7 Springer, NW cor. NE SW NW, Section 28-1s-8w, has been abandoned at 2,620 feet. American Pipe Line Co.'s No. 9 Nigh, SW cor. SE NW, Section 34-1s-8w, is pumping 25 bbls. from sand 1,717-20 feet. Ven Mex Oil Co. and Mid-Continent Petroleum Corp.s' No. 7 Nigh, C NE NW Section 34-1s-8w, has been completed for 135 bbls in sand 2,247-53 feet. Pace and others' No. 8 McMasters, SW cor. NW SE NE Section 13-2s-8w, is pumping 40 bbls. from sand 1,449-72 feet. No. 2 Watkins, NE cor. SW SE, Section 21-2s-7w, made 65 bbls. from sand 1,720-42 feet. Haynes and Carter Oil Co.'s No. 1 Woolsey, SE cor. SW NE, Section 4-3s-6w, has been abandoned at 2,261 feet.

Wagoner County

Cherokee Public Service Co. has a machine on the location for No. 2 J. Brown, CNL NW SW, Section 36-16-17. Horner and others' No. 2 P. Pitts, CWL E half SE SW, Section 6-17-18, has spudded and shut down for water. Ash Brothers' No. 1 R. Drew, SE cor. NW SW, Section 5-18-17, is rigging up.

Cherokee Public Service Co.'s No. 2 M. Marshall, NE cor. SE, Section 35-16-17, has been completed for 15 bbls. in sand 875-84 feet. C. F. Finefield's No. 7 Vann, SW cor. NW NE SW, Section 22-16-19, has been completed for 70 bbls. in sand 763-88 feet.

KANSAS FIELDS

(Continued from Page 48)

Section 7-19-3 and is the No. 2 Ewart. The production was found in the Viola lime at 2,851-71 feet where the hole filled up 800 feet with oil in four hours. It will be given a shot before being completed.

Barton County

T. B. Slick and others moved the rig in for No. 1 Sweeney, SW cor. NE, Section 23-17-11w.

Butler County

Aladdin Petroleum Co. made location for No. 1 Sharron, SE cor. NW, Section 24-27-3. E. W. Marland, Inc., made location for No. 1 Jones, SW cor. NE SW, Section 19-27-4. Tom Johnson made location for No. 2 Beadles, SW cor. NE, Section 8-27-6.

H. B. Garden's No. 3 Sluss "C," CEL NW NE, Section 6-27-6, is dry and abandoned at 2,759 feet. Richmond Drilling Co.'s No. 3 Brissey, NW cor. SE, Section 8-27-6, has been completed for 30 bbls. in sand at 2,741-47 feet. Magnolia Petroleum Co.'s No. 2 Riggs, NW cor. SW SE, Section 4-28-6, is dry and abandoned at 3,085 feet.

Cowley County

E. B. Shawver has the rig up for No. 2 Liggett, SE cor. NW NW, Section 15-31-3. Location has been made for No. 1 Oldham, NW cor. SE, Section 23-32-3. Reynolds & Wasson's rig has been built for No. 1 Watts, NE cor. NW, Section 15-33-3. Clearance & Reiter's No. 1 Claybaugh, SE cor. NW NE, Section 19-31-5, has been completed for 450,000 feet of gas in sand at 490-95 feet.

Ellis County

Stearns & Streeter made location for No. 1 Leiker, SW cor. NE, Section 26-13-20w. Jamot Brown and others staked location for No. 2 Gernster, NE cor. Section 13-13-18w.

Elk County

F. F. Flemming moved a machine in for No. 1 Bascom, SW cor. Section 9-29-9. Denton and others' No. 3 Elstun, SE cor. NW NW, Section 15-31-10, has been completed for 30 bbls. in lime at 1,985-2,022 feet.

Greenwood County

Tidal Oil Co.'s No. 7 Stanhipe, CSL NE NW, Section 22-26-8, is an old well drilling deeper at 2,875 feet. Empire Oil & Refining Co. moved the rig in for No. 5 Edwards "B," SE cor. Section 21-23-11. The rig is on the ground for No. 3 Edwards "A," NE cor. NW SW, Section 36-23-11. Central Petroleum Co.'s No. 7 Cartwright, CWL NE NW, Section 6-24-10, is drilling at 2,300 feet.

The Texas Company's No. 1 Barnard, SE cor. SW NW, Section 6-23-10, is dry and abandoned at 2,775 feet. Empire Oil & Refining Co.'s No. 3 Edwards "B," SW cor. SE SE, Section 21-23-11, made 467 bbls. in sand at 1,863-1,956 feet. Central Petroleum Co.'s No. 7 Cartwright, CWL NE NW, Section 6-24-10, has been completed for 40 bbls. in sand at 2,300-60 feet.

Harvey County

McPherson Oil & Gas Co.'s No. 1 Stauffer, C NW, Section 11-23-2w, is dry and abandoned at 3,075 feet. No. 1 Ruth, SW cor. NE NW, Section 14-23-2w, has been abandoned at 3,457 feet.

Kingman County

White Eagle Oil & Refining Co. and others moved the rig in for No. 1 Lorenz, NE cor. SW SE, Section 25-27-5w.

Marion County

White Eagle Oil & Refining Co. and others made location for No. 1 Ucker, NE cor. NW, Section 24-17-2.

McPherson County

Gardner Petroleum Co.'s No. 1 Benston, C NW SW, Section 32-18-2w, is an old gas well rigging up to deepen from 2,988 feet. Shell Petroleum Corp. has the rig on the ground for No. 3 Ritz, NW cor. NE SW, Section 1-20-2w.

Reno County

Empire Oil & Refining Co. made location for No. 1 Beltz, NE cor. NW, Section 36-25-4w.

Rice County

Curtis and others made location for No. 1 Green, C NW, Section 33-19-6w.

Sedgwick County

Graham Brothers' No. 1 Baker, Lot 9, Block 4, Greenwich Townsite, NE cor. SW SW, Section 15-26-2, is drilling at 330 feet. Graham Brothers and Shell Petroleum Corp.'s No. 1 Bogue, Lot 16, Block 11, SE cor. SW SW, Section 15-26-2, Greenwich Townsite Pool, is a cellar.

Bu Vi Bar Petroleum Corp. and others' No. 8 Carr, SW cor. NE SE, Section 1-26-1w, Valley Center Pool, has been completed for 430 bbls. in sand at 3,378-82 feet. Shell Petroleum Corp.'s No. 1 Borg, NW cor. NE SW, Section 14-26-2, is dry and abandoned at 3,219½ feet. No. 3 Community, Lot 12, Block 8, Greenwich Townsite, SE cor. NW SE SW, Section 15-26-2, made 412 bbls. in chat at 2,926-29 feet.

Sumner County

Lario Oil & Gas Co. has the rig up for No. 1 Henderson, NW cor. SW, Section 21-30-1w. Continental Oil Co. has the rig on the ground for No. 2 Padgett, SW cor. Section 23-34-2.

Woodson County

Harper Oil & Gas Co.'s No. 1 Reed, NW cor. SE, Section 28-23-14, is spudding. Derby Oil Co. and others' No. 1 Kenyon, NE cor. SE NW, Section 29-23-15, has been completed for 10 bbls. in sand at 1,550-54 feet.

CALIFORNIA FIELDS

(Continued from Page 60)

rigs are in course of construction. A concerted attempt has been made to hold back deep-zone exploration in this field until a more opportune time but the situation seems to be getting beyond control with the result that several holes will probably reach the projected depth at which lower zone production is anticipated within the next 30 or 60 days.

Wildcats

No. 1 More, a wildcat of the General Petroleum near Goleta in Santa Barbara County, which blew in out of control two weeks ago, has been subdued but the pressure is so high that the crew cannot resume work. The well has not been killed but is under control and field reports indicate that it is making about 25,000,000 feet of natural gas daily. The output is being run through a series of traps and, while the gas is relatively dry, the well is yielding approximately 50 bbls. of 46 gravity crude. Operators are still undecided as to whether the General Petroleum has opened up a new oil field or whether the gas is coming from fractured shale. The difference of opinion on this well is due to the fact that no one knows just where the gas is entering the hole. The Santa Barbara Field looks like it is just about through. The General Petroleum has quitclaimed all its holdings in this area with the result that the Olympic Oil & Refining Co. has all its leases back again. Shortly after the field was opened up the former took over all but one lease held by the latter on a development basis but subsequent work was so unsatisfactory that this company pulled up stakes. Even the discovery well was turned back when it turned to water. Development work in the shallow Summerland Field of Santa Barbara

Wharf being built by Honolulu Consolidated Oil Co. in ocean fronting on Elwood Field, to develop a tideland drilling permit.

County is going along rather slowly due to the inability to dispose of production but several new wells are scheduled to be started within the next few weeks. The Associated Oil Co. has started constructing two new rigs on the Southern Pacific Railroad's right of way, which parallels the state highway which bisects the field. The Lincoln Drilling Co.'s deep-zone discovery, No. 1 Williams, is pumping 280 bbls. daily from 1,417 feet. No. 2 Williams, located about 100 feet away, was rotating ahead a few days ago at 711 feet. George F. Getty has recemented his No. 1 Becker fee at 1,038 feet and this well, which is located 130 feet due east of the discovery, should pick up the pay soon. The Summerland Field of Santa Barbara County has been producing a small quantity of heavy oil from shallow wells out in the open ocean for a number of years but it remained for R. E. (Bob) Bering to prove up the existence of a second shallow zone in the western end of the field.

TEXAS PANHANDLE

(Continued from Page 62)

4 Poteet made 810 bbls. at 1,446-1,525 feet. Shell Oil Co.'s No. 1 Field & Bowers had an initial production of 148 bbls. at 1,188-97 feet.

Jack County

F. H. E. Oil Co.'s No. 4 Leffell had an initial production of 145 bbls. at 3,-063-82 feet. L. C. Harper's No. 3 Leffell had an initial production of 350 bbls. at 2,995-3,115 feet. Their No. 4 Leffell had an initial production of 460 bbls. at 3,-088-3,147 feet. Petroleum Producers Co.'s No. 2 Shanafelt had an initial production of 52 bbls. at 3,095-3,108 feet. Prairie Oil & Gas Co.'s No. 3 Bryson had an initial production of 3,000,000 feet of gas and 25 bbls. of oil at 2,995-3,050 feet. Prairie Oil & Gas Co.'s No. 5 Bryson had an initial production of 86 bbls. at 3,103-22 feet.

Montague County

Claude Bell and others' No. 1 Gaston was dry and abandoned at 2,004 feet. Carter-Rycade's No. 9 Cunningham had an initial production of 30 bbls. at 920-28 feet. Farlyn Oil Co.'s No. 2 Cunningham made 10,000,000 feet of gas at 1,-324 feet after having been shot with 24 quarts at 760-800 feet. The Texas Company's No. 4 Hinton had an initial production of 40 bbls. at 786-91½ feet.

Wichita County

Continental Oil Co.'s No. 1 Dodson-A was dry and abandoned at 1,484 feet. Duncan & White's No. 1 Parker was dry and abandoned at 1,345 feet. Magnolia Petroleum Co.'s No. 15 Donehoo was dry and abandoned at 1,526 feet. Stump-Melat & Graham's No. 2 Cludup had an initial production of 73 bbls. at 1,806-20 feet. Swanner's No. 1 Parker was dry and abandoned at 735 feet. Temple's No. 1 Norwood was dry and abandoned at 800 feet. Bradstreet Co.'s No. 1 Love was dry and abandoned at 1,906 feet. Coleman & Coppock's No. 1 Kemp & Kempner had an initial production of 40 bbls. at 1,793-1,802 feet. Culberson's No. 56 Waggoner made 30 bbls. at 1,587-1,600 feet. Their No. 57 Waggoner was dry and abandoned at 1,608 feet. Their No. 58 Waggoner was dry and abandoned at 1,628 feet. Their No. 59 Waggoner had an initial production of 10 bbls. at 1,370-85 feet. Their No. 60 Waggoner had an initial production of 20 bbls. at 1,372-88 feet. Their No. 61 Waggoner was dry and abandoned at 1,624 feet. Cunningham & Pennell's No. 1 McClure made 3 bbls. at 495-505 feet. Their No. 2 McClure had an initial production of 3 bbls. at 397-414 feet. Their No. 3 McClure had an initial production of 4 bbls. at 389-410 feet. Their No. 4 McClure had an initial production of 4 bbls. at 365-408 feet. Everts-Jamison No. 1 Gibson had an initial production of 75 bbls. at 1,906-29 feet. Humble and Hines' No. 4 Waggoner had an initial production of 15 bbls. at 1,322-34 feet. King Royalty Co.'s No. 6 Key Boyd was drilled to a total depth of 1,777 feet. This is a key well.

Young County

Camp Oil & Gas Co.'s No. 1 Campbell was dry and abandoned at 971 feet. Carpenter's No. 7 Barrett had an initial production of 8 bbls. at 570-618 feet. Panhandle Refining Co.'s No. 3 Pittman was dry and abandoned at 802 feet. Their No. 1 Roach was dry and abandoned at 800 feet. Richardson-Dresser's No. 2 Dean was dry and abandoned at 688 feet. Stafford's No. 2 Brown was dry and abandoned at 584 feet. United Royalty Co.'s No. 4 Carpenter was dry and abandoned at 660 feet. Brandeberry's No. 2 Waggoner had an initial production of 42 bbls. at 2,317-2,322 feet and was drilled to a total depth of 2,435 feet. Empire Gas & Fuel Co.'s No. 6 Waggoner had an initial production of 138 bbls. at 1,830-51 feet. Their No. 8 Waggoner made 330 bbls. at 2,272-2,305 feet. Fain-McGaha's No. 17 Waggoner made 250 bbls. at 2,290-2,310 feet. Golding Cochran and others' No. 1 Bateman Waggoner was dry and abandoned at 2,455 feet. Lewis Production Co.'s No. 4 Waggoner made 100 bbls. at 2,399-2,407 feet. Their No. 5 Waggoner made 90 bbls. after having been shot with 30 quarts at 2,395-2,413 feet. Melat Oil Co.'s No. 9 Waggoner made 105 bbls. at 1,987-98 feet. Staley-Wynne's No. 1 Waggoner had an initial production of 155 bbls. at 1,851-66 feet. Their No. 3 Waggoner had an initial production of 210 bbls. at 1,852-67 feet. Their No. 11 Waggoner had an initial production of 136 bbls. at 2,290-99 feet. Their No. 19 Waggoner had an initial productioin of 130 bbls. at 1,848-70 feet. Waggoner Refining Co.'s No. 1

(Continued on Page 358)

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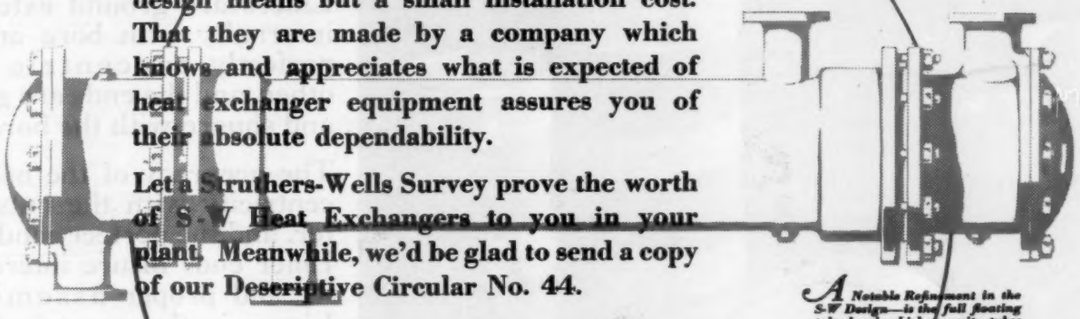

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AXELSON OIL WELL *Liner* PUMPS

PURE OIL CO. COMPLETES 220-BBL. WELL IN MUSKINGUM COUNTY, OHIO

By D. S. Wakenight
Staff Correspondent, Eastern Fields

PITTSBURGH, Pa., Aug. 26.—Development work in the Eastern fields in the last week was featured by one good producer and several light pumpers. The one good well completed is the Pure Oil Co.'s test on the Lloyd McKee farm in Section 6, Jackson Township, Muskingum County, Ohio. The first 24 hours after being drilled into the Clinton sand and shot it produced 220 bbls. In the northwest quarter of Section 34, the Hope Construction & Refining Co. got a 45-bbl. producer at No. 6 on the Edward L. McCune farm.

West Virginia had two wells better than the average. In Clay County, Henry district, the Virginian Gasoline & Oil Co. completed a well in the Big Injun sand, No. 19 on the Bron, Swan, Gorhor & Geary tract. It is good for 25 bbls. a day.

On Armstrong Creek, Sherman district, Boone County, Godfrey L. Cabot, Inc., has completed in the Big Injun sand No. 3 on the Lafolette, Robson & Prichard tract. It is a gasser good for 5,500,000 feet. Operations in this county are still active. There are 20 wells drilling and one rig up.

Geary district, Roane County, continues to complete light pumpers. In Geary district, the South Penn Oil Co. has completed in the Big Injun sand No. 98 on the O. D. Stockly farm. It is estimated to be good for 10 bbls. a day.

On Plum Run, Williams district, Wood County, O. E. Grow has drilled No. 17 on the Timothy McAtee farm into the first Cow Run sand and it is good for 5 bbls. a day. In Geary district, Roane County, the South Penn Oil Co. has completed in the Big Injun sand No. 96 on the O. D. Stockly farm. It is estimated to be good for 20 bbls. a day.

On Elk River, Big Sandy district, Kanawha County, the Virginian Gasoline & Oil Co. shot in the Weir sand its No. 4 on the J. H. Davis farm. Its production was increased from almost nothing to 2 bbls. a day.

Gassers in Boone County

In Crook district, Boone County, the United Fuel Gas Co. has a gasser in the Berea grit at No. 1,879 on the Louisa F. Chew farm. In the same district, the Owens Bottle & Machine Co. has a light gasser at No. 16 on the T. W. Bedford farm. In Peytonia district, the same company has a fair gasser at No. 18 on the Peytonia Land Co.'s property. In Scott district, the Mountain States Fuel Co. has a fair gasser at a test on the Rome Prince farm.

On Sugar Camp Run, Geary district, Roane County, the Heck Oil Co. has completed in the Berea grit a second test on the H. W. Allen farm. It is a natural producer, showing for 50 bbls. a day. In Henry district, Clay County, the Virginian Gasoline & Oil Co. has completed in the Big Injun sand No. 7 on the James Reed farm. It is estimated to be good for 25 bbls. a day.

On Big Run, Williams district, Wood County, C. M. Maybaugh has completed in the Salt sand a second test on the Pugh heirs' farm. It is a 4-bbl. pumper. On Walnut Creek, Elk district, Kanawha County, the Virginian Gasoline & Oil Co. has completed No. 19 on the J. F. Brown 500-acre farm good for 12 bbls. a day in the Squaw sand.

On Walnut Fork of Clover Run, Smithfield district, Roane County, the Ohio Valley Gas Co. has completed in the Big Injun sand No. 4 on the T. Morris Perot, Jr., farm. It is a 2-bbl. pumper. On Sugar Creek Run, Reedy district, the Heck Oil Co. completed in the Berea grit No. 5 on the A. D. Tallman farm. It is showing for 5 or 6 bbls. a day. On McCord branch of Days Run, Clay district, Monongalia County, the Philadelphia Oil Co. has a light pumper in the Big Injun sand at a test on the William L. Keck farm. In Center district, Calhoun County, W. H. Bickel has completed in the Big Injun sand a test on the Arthur Turner farm. It is a gasser good for 500,000 feet.

Two in the Big Injun

In Geary district, Roane County, Noble Beattie and others have completed in the Big Injun sand a test on the Floyd Hopkins & Co.'s farm. It is a 4-bbl. pumper in the Big Injun sand. Located 600 feet southeast of the first test on the Alfred Shields farm, the South Penn Oil Co. has completed a second test. It is estimated to be good for 10 bbls. a day in the Big Injun sand.

In McKim district, Pleasants County, Charles Hastings & Co. have a duster at a test on the Samuel Robinson farm. In Jefferson district, Lafayette Pethtel is drilling a test on the Edward Hilerman farm. In Spencer district, Roane County, the Federal Oil & Gas Co. had the same kind of luck at a test on the Filmore Summers farm. In Geary district, the United Fuel Gas Co. has a gasser at a second test on the T. E. Graham farm.

In McClellan district, Doddridge County, Godfrey L. Cabot has completed in the Gordon sand a test on the Robert Chipps farm. It is good for 15 bbls. a day.

On Buck Run of Sandy Creek, Ravenwood district, Jackson County, the South Penn Oil Co. has completed in the Berea grit No. 8 on the C. S. McCarty farm. It is estimated to be good for 25 bbls. a day. In Reedy district, Roane County, Heck & Co. have completed No. 5 A. D. Tallman farm and it is a 6-bbl. pumper in the Berea grit. In Harper district, Roane County, the United Fuel Co. has completed its No. 2 on the J. W. Westfall farm. It is dry in the Salt sand.

SOUTHEAST OHIO

In Section 9, Fox Township, Carroll County, the Ben Oil Co.'s test on the J. B. Ferguson farm is a light pumper in the Berea grit. In the Fisher Pool, Lot 89, Athens County, Young and others have completed a test on the F. P. White farm. It is dry in the Berea grit. In the NW Section 22, York Township, Morgan County, the Gas Producing Co. of Ohio has completed in the Clinton sand a second test on the P. F. Tharp farm. It produced 20 bbls. the first 24 hours. In Section 24, Rumley Township, Harrison County, the Moore Hendricks Oil Co. has completed its second test on the J. Frank Perry farm. It is a light producer in the Berea grit. In the northeast part of Section 11, Lawrence Township, Washington County, the J. B. Braden Oil Co. and others have completed their No. 4 on the Florence Reed farm. It is dry in the second Cow Run.

Located in Section 13, Rush Creek Township, Fairfield County, Ohio, the Hope Construction & Refining Co. has discontinued drilling its test on the S. W. Black farm after going to a depth of 5,095 feet. At a depth of 5,087 feet salt water was encountered and the hole filled up 1,200 feet over night. Neither oil nor gas was encountered after leaving the Clinton sand. In that formation a light show of oil was developed and the hole will be filled up to that level and tested. It will probably make a 10-bbl. pumper.

This well was drilled deeper than any other in that part of southeast Ohio. In the vicinity of Newark, Licking County, some wells have been drilled into the Trenton Rock and got oil at about 4,000 feet.

In the NW Section 17, Washington Township, Hocking County, located in Jobs Hollow, 2 miles from production, the Preston Oil Co. has completed in the Clinton sand No. 1,320 on the Sunday Creek Coal Co.'s property. It is a gas-

(Continued on Page 321)

COMPLETIONS PLENTY IN ILLINOIS; INDIANA REPORTS FOUR, LIMA QUIET

By Whit
Staff Correspondent, Central West Fields

FINDLAY, Ohio., Aug. 26.—The only division of the Central West Field that failed to show a completion is the old Lima Field of northwestern Ohio, where few wells are under way.

Three completions were reported from the Indiana fields, all three in Sullivan County in the western part of the state. In Fairbanks Township the Twin Creek Oil Co., with J. L. Bowman, receiver, drilled in No. 3 E. Williams, Section 5, with an initial production of 25 bbls., at 2,195 feet.

In Turman Township, same county, Burns and others' test of the L. E. Duffer, Section 30, produced 125,000 feet of gas at a depth of 857 feet. The same firm's No. 1 in the Mary Mann farm, same section, also produced 125,000 feet of gas at 865 feet.

CENTRAL OHIO

Twenty-two completions were reported from the Central Ohio fields since the last review, of which 12 were producers with an initial total production of 73 bbls., 5 dry holes and 5 gas wells. In new work starting, 13 new locations were made and 41 new wells started spudding. This work includes 18 counties in the central portion of the state.

In Ashland County, Perry Township, the Preston Oil Co.'s No. 3-1349 on the M. Devault, Section 29, shows for a fair gas well and 10 bbls. of oil initial in the Berea sand at 675 to 719 feet. Robinson and others drilled a dry hole in No. 2 on the G. M. Heffelfinger, Section 9, Lake Township.

In Medina County, Chatham Township, the East Ohio Gas Co.'s No. 6 on the J. and J. A. Jalensics, Lot 2 Chatham Township, reported 4 bbls. initial at a depth of 325 feet. The Oko Oil & Gas Co.'s No. 17 on the Sanford Watson, Lot 3, Section 10, reported 15 bbls. initial at 340 feet. In Harrisville Township, Ray C. Jones' test on the A. D. Falconer, Lot 26, was dry at 400 feet.

In Lorain County, Easton Township, the Ohio Fuel Gas Co. has a gas well in No. 1-1741 on the Earl C. Fireback, Lot 21.

In Summit County the East Ohio Gas Co. drilled in an unusually good gas well in a test on the John M. Weaver. The Red Sand was found at 4,070 to 4,074 feet, and the gas was found in the Clinton at 4,109 to 4,139 feet. This well in in Section 23, Franklin Township. Ohio Fuel Gas Co. made locations for No. 1 on the Adam Kepler, Section 13, and for No. 2 on the Elton H. Daily, Section 26, Franklin Township.

In Licking County, Fallsburg Township, the Preston Oil Co.'s second test on the Wayland Ashcraft, Section 11, is reported good for 4 bbls. initial at 756 to 766 feet, which is the Berea sand. In Perry Township, the Ohio Fuel Gas Co.'s test on the J. P. Murphy, Section 15, is reported good for 7 bbls. in the Berea sand at 745 to 757 feet. Whitehill Oil Co. is drilling No. 5 on the J. C. Burkholder, Section 3, in the Berea sand at 598 to 608 feet.

In Muskingum County, Rich Hill Township, the Athey Co. got a dry hole in a test on the W. T. Osborne, Section 7. The top of the lime was found at 2,980 feet, and salt water at 3,270 to 3,500 feet. In Perry Township, the Mid-East Oil Co. also found a dry hole in a test on the Walter Gotter, Section 15, in the Berea sand at 1,141 to 1,148 feet, total depth 1,165 feet. The same company is drilling a test on the C. M. Tom, Section 16, same township.

In Athens County the Ohio Fuel Gas Co.'s No. 6-4561 on the J. W. Kincade, in fractional Section 1, Carthage Township, is a fair gas well in the Injun sand at 1,195 to 1,309 feet.

In Meigs County, Sutton Township, Smith and Waterman's test on the A. E. and D. Carnahan, Section 11, is rated good for 10 bbls. in the Cow Run sand at

(Continued on Page 388)

GREENVILLE FIELD, MUHLENBURG COUNTY, INTERESTS KENTUCKIANS

By Whit
Staff Correspondent, Kentucky-Tennessee

OWENSBORO, Ky., Aug. 24.—Oil operators are paying much attention to the new Greenville Field in Muhlenburg County, which was opened a couple of months ago by the Ohio Oil Co., when this company brought in a good well on the R. O. Kennedy farm, just south of Greenville. Word now comes from that field that Young & Ellis have an excellent showing in a test on the Rice Brothers farm in the same field, and some say it shows just as good as No. 1 on the Bradshear lease, close by. Following the showing found in the Rice well another showing is reported in the test on the Jack Corley lease, in the same field, by the Missouri-Kansas Pipe Line Co. Ellis & Young will start working at once on an outlet for their crude, by laying a pipe line over a mile from the two wells to the railroad where storage and a loading rack will be put in as rapidly as the work can be done. The production in the Bradshear well went off some, but the tools were run in the hole and drilled about 4 feet deeper when the well started boiling over and had to be capped to force it into the tanks. When first drilled in the pay sand was only slightly tapped and it flowed at the rate of about 500 bbls., and the additional drilling brought the well back much stronger than when first drilled into the sand. The Rice well does not make the good showing that the Bradshear well did, but has all the earmarks of a good producer.

The Niagara Field in Henderson County has had enough drilling done to show that a field worth while has been found. H. Z. Clark's No. 1 on the J. C. Duncan farm, about 250 yards north of the good well on the G. P. Jeter farm looks like a good well, but not as large as the Jeter well. Turner & Lewis' test on the Walker Thornberry in the same area may produce around 35 bbls. from a depth of 731 feet.

One of the outstanding features since the last review from the field has caused unusual excitement, which was brought about by the Roxana Petroleum Corp. test in the Friendship Chapel area of Daviess County, which is reported to have tapped the McCloskey sand at a depth of 1,165 feet, and the hole filled up close to 100 feet in a few minutes This is said to be one of the most important discoveries since the Owensboro Field was opened. An 18-inch vein of oil which is said to resemble Pennsylvania high-grade crude brought the attention of the oil men to this fact. The sand is similar to the Gordon sand found in the Pennsylvania Field. Oil men state many of the older wells that have gone down in production will be drilled deeper until the McCloskey sand is reached for the higher grade crude. The Roxana Petroleum Corp. will give the new sand a thorough testing as the parent company, the Shell Petroleum Corp., can make good use of this grade for cylinder stocks and the showing made in the Roxana well

(Continued on Page 387)

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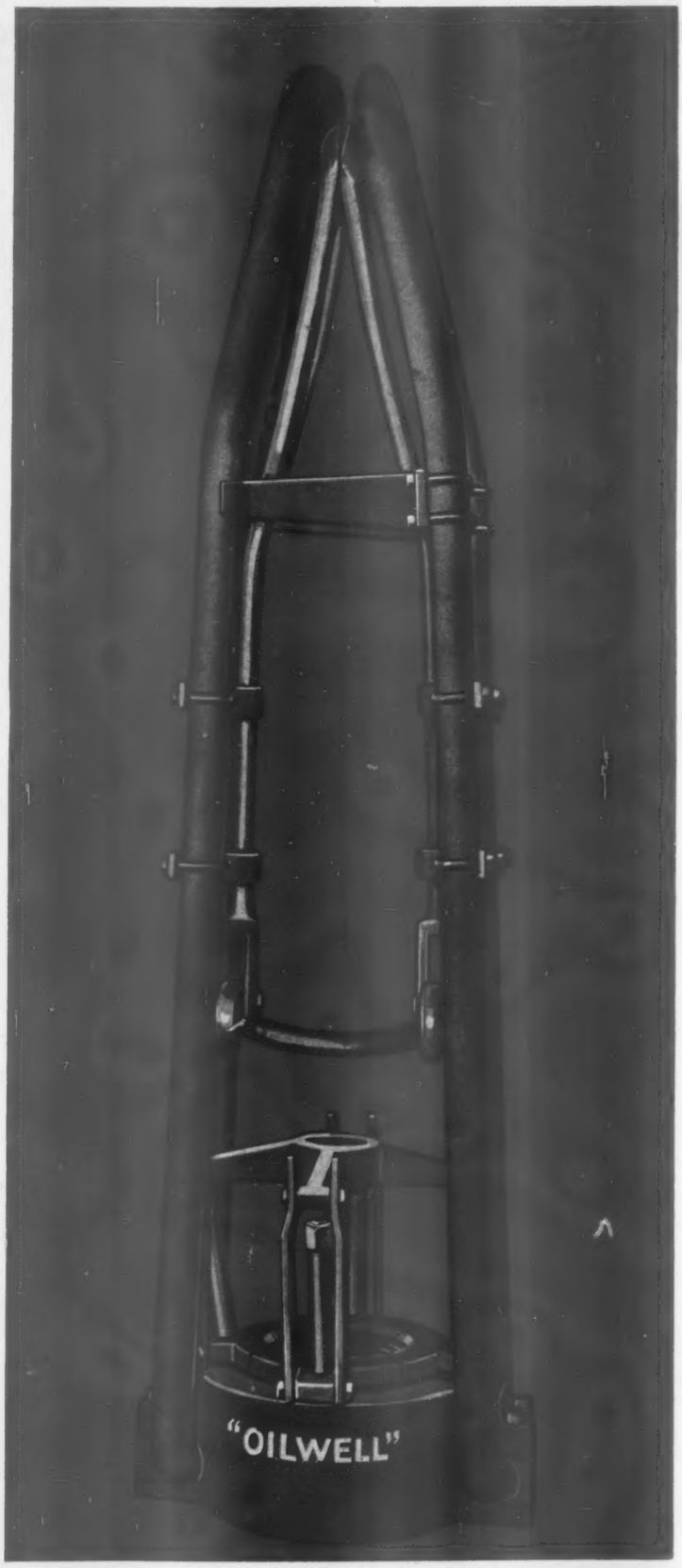

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One of the best liked, most courteous and able executives in the pipe line industry in the United States is Ralph V. Hanrahan, president of the Humble Pipe Line Company. Quiet and unassuming, Mr. Hanrahan has a great faculty for making friends and holding them while his experience and ability in solving pipe line problems, constructing lines and operating the great system which he heads has won him the admiration and regard of pipe line men everywhere.

A good insight into Mr. Hanrahan's character is gained from a note he sent the writer of this sketch in reply to a request for certain information to be used in this connection. He said: "It would seem to me that a better subject for you would be to use W. F. Gates, president of the Prairie Pipe Line Company, who is an outstanding pipe line man covering a long period of years and who was good enough to give me my first job on a pipe line."

Mr. Hanrahan was born in Olean, N. Y., October 10, 1885. He moved to Montpelier, Ind., in 1895, obtaining his education in the schools of Olean and Montpelier. He began his pipe line career in July, 1901, when he entered the service of the Indiana Pipe Line Company. He continued with the Indiana until June 30, 1904, when he became connected with the pipe line department of the Ohio Oil Company. He served with the Ohio Oil Company until May 10, 1909, and went with the Standard Oil Company of Louisiana, pipe line department, the next day. He continued with that company until he entered the service of the Humble on March 8, 1919.

Mr. Hanrahan makes his headquarters in Houston, Tex. His company has been especially active since the opening of the big pools in West Texas but even with his heavy responsibilities Mr. Hanrahan has kept in close touch with the progress made by the industry in the matter of standardization of equipment, and in developments relating to corrosion and different methods and practices used in the pipe line industry. He is a member of the standardization committees of the American Petroleum Institute.

PERSONAL PARAGRAPHS

James Nolan of the Barnsdall Oil Corporation, Midland, Tex., is in Tulsa on business.

* * *

L. C. Decius has succeeded J. A. Taff as chief geologist of the Associated Oil Company.

* * *

W. H. Geis has resigned as vice president of the Continental Oil Company to become president of the Arrowhead Oil Company.

Pat Hitt, connected with the Transcontinental Oil Company's office in San Angelo, Tex., was a Fort Worth visitor this week.

* * *

Wallace Pratt, Houston, Tex., director of the Humble Oil & Refining Company, has returned from a short trip over West Texas.

* * *

A. L. Wainwright has been placed in charge of offices in the Milam Building, San Antonio, Tex., established by the Amerada Petroleum Corporation.

* * *

Harry Miller, manager of oil country sales for the Detroit Graphite Company, spent a few days in Tulsa, returning direct to his Chicago headquarters.

* * *

E. B. Reeser, Tulsa, president of the Barnsdall Oil Corporation and president of the American Petroleum Institute, is in California on a business trip.

* * *

Loring G. Bradstreet, Jr., assistant district superintendent for the L. G. Bradstreet Company, has returned to Electra after a few days visit in Fort Worth.

* * *

Lawrence Shadbolt, independent operator of Meridian, Miss., has been visiting Fort Worth and West Texas on business. Mr. Shadbolt formerly resided in Fort Worth.

* * *

C. R. Thomas, who has had charge of the geological work in Kansas for the Skelly Oil Company for the last two years, has resigned this position to enter independent operations.

* * *

Roy Francis is now connected with the Chicago office of the Galena Signal Oil Company. He recently resigned his position with the Petroleum Exchange, Inc., of Chicago.

* * *

George Pohler, Tulsa, purchasing agent for the Mid-Continent Petroleum Corporation, is critically ill as a result of a general breakdown and is in a sanitarium in Marion, Ohio.

* * *

Carl Russ, chief clerk of the Gulf Production Company, Houston, Tex., is away from his office on a summer vacation, which he is spending at fishing resorts along the coast.

* * *

J. T. Hamilton, scout for the Sun Oil Company on the Fault Line, and Mrs. Hamilton have left for a two weeks' vacation to be spent in Colorado. The trip will be made by automobile.

* * *

F. D. Shanks, of the Arkansas Natural Gas Corporation headquarters staff in Shreveport, La., has been transferred to Pine Bluff, Ark., as superintendent of the Pine Bluff division.

* * *

Frank W. DeWolf, vice president and general manager of the Louisiana Land & Exploration Company, Houston, Tex., is spending three weeks in the East, mostly in Schenectady, N. Y.

* * *

D. F. Scott, of the executive department of the Gulf Production Company, Houston, Tex., has left on a motor trip to New York and other eastern points for a two weeks' vacation.

* * *

T. N. Smith and associates who organized the Luling Oil & Gas Company and got the first Edwards lime showing at the northeast end of the Joe Bruner Field in Texas, have organized the Muldoon Oil Company.

* * *

S. W. Emery, superintendent of production for the Carter Oil Company, at Duncan, Okla., spent several days in Tulsa. Mr. Emery in addition to supervising the properties of the Carter Oil Company, is also in charge of the production of the Humble Oil & Refining Company's leases in the Duncan Field.

* * *

R. E. Walker, representing the American Rolling Mill Company, of Middletown, Ohio, has been given supervision over the business of his company relating to the petroleum industry and has established residence in Tulsa. Mr. Walker will have temporary headquarters at the Albany Hotel, Tulsa, until after the Petroleum Exposition when he will open offices for his company.

James E. Logan of the Humble Pipe Line Company, Iraan, Tex., has been spending his vacation with his brother, R. B. Logan, at Fort Worth, Tex. The latter is in charge of the Logan Map Company at Fort Worth.

* * *

Harry Hughes, sales manager of the Barnsdall Refineries, Inc., Tulsa, will be at the Chicago offices of the company until September 1. W. W. Rice of the Chicago office will return on that date from a vacation.

* * *

W. W. Scott, petroleum engineer for the Humble Oil & Refining Company in the Texas coastal fields, has returned to Houston from a trip to El Dorado, Ark., where he attended a conference on petroleum engineering and development.

* * *

John R. Suman, director of the Humble Oil & Refining Company, Houston, Tex., accompanied by his family, is in the East on an extended vacation They made the trip to New York by boat, sailing from Galveston, Tex., and will return overland.

* * *

Rolla W. Walling has resigned as assistant petroleum engineer of the Associated Oil Company to become gas engineer with the California State Mining Bureau, which organization will be charged with enforcement of the new gas conservation law.

* * *

M. C. Loutt and Hall Deargmo, representatives of the Kendall Refining Company of Bradford, Pa., were in Sweetwater, Tex., recently en route to the West Coast where Mr. Loutt will join his wife, the former Miss Viola Curwood, daughter of James Oliver Curwood.

* * *

Arch W. Leonard, member of the management committee of the Chestnut & Smith Corporation, Tulsa, has returned from an airplane trip to Amarillo, Breckenridge, and Ranger, Tex., and Shreveport, La., where he inspected the natural gasoline plants of the company.

* * *

W. O. Todd of the Todd Drilling Company, flew up to Coalinga and Kettleman Hills and returned to Los Angeles five hours later. Mr. Todd was able to inspect the operations of his company in an area several hundred miles away and return home in less than the usual working day.

* * *

C. H. Eden, representing the Lees-Bradner Company, Cleveland, Ohio, manufacturer of milling machines, is spending a few days in the Mid-Continent Field after which he will make a European trip calling on the manufacturers of oil field equipment in England, Germany and other European countries.

* * *

H. G. Schneider, manager of the land geological division of the Dixie Oil Company, Shreveport, La., spent last week in the Muskegon and Mount Pleasant Field of Michigan. The Dixie company's Michigan offices are in Muskegon. L. G. Mossburg, of the land geological division, also was a Muskegon visitor for several days.

* * *

A. P. McCarnes, manager of the Transcontinental Oil Company's wholesale station for West Texas, in San Angelo, and Mrs. McCarnes, who until August 3 was Miss Juanita McClain of Point Marion, Pa., have arrived in San Angelo. E. C. McCarnes, the father of A. P. McCarnes, is production superintendent for the Transcontinental in West Texas and New Mexico, having headquarters in San Angelo.

* * *

H. E. Cassidy, sales research manager for the Axelson Machine Company, Los Angeles, Calif., left for Tulsa to make arrangements for the Axelson exhibit at the Petroleum Exposition in October. From Tulsa, Mr. Cassidy planned to visit the St. Louis, Mo., plant of the Axelson company, then to Cleveland, Ohio, for the National Air Races and Air Exposition.

* * *

Ralph H. McKee has received the degree of LL.D. from the University of Maine, the particular reason for the honor being his having started the first courses in paper technology in this country while at that University. On June 17, Doctor McKee received the degree of D.Sc. from the College of Wooster (Ohio), his alma mater. His work on shale oil and the inauguration of a new type of reforestation for pulpwood were the accomplishments stressed in this connection.

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Field Problems and Their Solution

EDITED BY THOMAS F. SMILEY

In order that men connected with the drilling, producing and transporting branches of the petroleum industry may procure quickly a solution of many problems confronting them from time to time in their work, The Oil and Gas Journal has arranged with leading engineers and other recognized authorities to answer questions submitted by readers of this publication pertaining to the work of drilling and producing crude oil and transporting this product.

Everyone is invited to submit questions freely. These questions will be submitted to proper authorities by Mr. Smiley, who edits the page, and answers, based on the best available information, will be published. Each question should give as much detail as possible, especially where it relates to matters where depths of sands, types of sands and operations on adjoining properties would have a bearing on the problem involved. The source of all questions will be considered as confidential and only initials will be published in connection with the question.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or practices which are improvements.

In case an immediate answer is important, one will be given by mail if the writer requests it.

WHICH WAY DOES HOLE GO?

There has been considerable argument here lately about crooked holes. Most of the argument is about which way the hole is going to slant. That is, will it go in the same direction as the formation or will it turn into the formation. Some of the men contend that when the bit strikes a sloping hard rock it will slide along the slope or at least that its tendency will be to do that. Others say the bit will be checked when it hits this hard rock, throwing the top of the drill stem away from the rock and making a tendency for the bit to go into the rock at an angle. Can you tell us which is right? —N. S. E.

The type of formation would have some influence upon the direction of the hole, but Alexander Anderson, in his paper on "Underground Surveys of Oil Wells," read before the A.I.M.E. meeting in New York last February, states:

"Where the dip of the strata does not exceed 10 degrees it has been noticed that in some fields there is a tendency for wells to butt into the structure. Sometimes, for this reason, a well may end up several hundred feet higher on the structure than the position of the derrick would indicate. Instances of wells butting into the structure have been found even when the dip was known to be 60 degrees, and very interesting geologic information has been obtained from cores taken from wells of this kind which traveled into and across a structure at a very flat inclination.

"As the dip of the strata gets higher, the proportion of wells which butt into the structure usually becomes smaller. Where the dip is around 25 degrees, many wells may follow the direction of the strike and many may follow a general downward dip direction. When not too near the edge of the field, a carefully drilled down-dip well may make a good producer, but if one of these wells is carelessly drilled, it will frequently be forced completely out of the field and cores taken from such a well may show vertical striation because the well has become parallel with the strata.

"Wells which start out with a drift along the strike, often change direction and may either butt into the structure or run down dip. In some parts of certain fields, adjoining wells show very similar inclinations and direction of drift. In these locations, redrilling may succeed in lessening the amount of drift but is apt to fail to alter materially the direction of drift.

"In other parts of the field there may be a critical depth at which a well will either make a change of direction up or down structure. Under such conditions, when the hole is redrilled from the critical depth, it may take a more favorable direction and a good producer is often obtained from a previously hopeless hole."

At the same meeting a paper was read by E. H. Griswold, on "Acid Bottle Well Survey," in which he stated in a paragraph under the heading, "Direction of Deflection":

"However, from the gentle bends and uniform slopes of most wells surveyed so far, it appears reasonable to expect that deviation is at least in the same general direction, as a change in direction, with respect to the strike of the formation, would cause sharp changes in the angles of inclination. The compass surveys taken from core drill holes in nonmagnetic mining regions substantiate the theory that deflection is all in one general direction and also indicate that when steeply dipping strata are penetrated, the deflection is down-dip, while with gently dipping strata the deflection is toward the up-dip side."

These statements, coupled with the fact that since the producing companies have started to write clauses into their drilling contracts limiting the amount of deflection from vertical permissible for the hole at any point which have caused the holes to be drilled much more nearly vertical, seem to indicate that there is no general rule that can be applied to this problem for there are variables that have their influence on the type of hole drilled, and the dip of the formation is only one of them.

DOES SHUTDOWN HURT WELL?

When the shutdown order was in force in the Seminole Field there was considerable division of opinion as to whether shutting in a well injured it permanently, reducing the ultimate recovery. Has this question ever been settled by the petroleum engineers one way or the other?—N. R. N.

This has always been a much debated question and opinions have been expressed on both sides and attempts made to prove them by the use of statistics, but it is still open to discussion and really resolves itself into a question concerning the policy of the company having the well or wells.

Theoretically, if a well is properly completed and cased the underground condition is not changed so long as the well is not permitted to flow or is not pumped or produced by other means.

Under such conditions the well is merely a hole drilled into the oil reservoir and subject to handling as a pipe line from a tank or other receptacle would be. If the gates at the well-head are closed the conditions underground should remain stationary during the shutdown period, for upon ceasing to withdraw oil and gas from the sands equilibrium should be established between all forces underground and movement should cease.

However, it has been found that the character of the reservoir rock has a great deal to do with the ability to shut in a well, and also the method of operating adjoining properties will have its effect.

The main unknown factor in the whole problem is what would have been considered "ultimate recovery" if the well had been allowed to flow unrestricted or if it had been controlled during all stages of its productive life and at times shut in because of economic conditions.

In as much as it is only possible to estimate the total amount of oil that could be obtained from any sand body, it is almost impossible to arrive at the exact volume of oil that is in the reservoir, and in addition there are so many other unknown factors underground that cannot be checked definitely that at best any estimate of total oil recovered with relation to that in the reservoir is likely to be inaccurate.

From a practical standpoint of operation it was not found that any unfavorable results were caused by the enforcement of the shutdown orders in Seminole, for it has been estimated by petroleum engineers with the Bureau of Mines that final recovery in that area will be about 35 per cent of the theoretical, which is a high return from any type of oil-bearing structure.

WHY WAS IT CALLED THAT?

BRIDLE-IRONS

This term was introduced into the oil industry by the early rig builders, who used it formerly in connection with a flat strip of iron bent to support a timber. As used in the rig the stirrup is reversed and the purpose of the bridle-irons is to hold the cap on the jack post boxes down or against the upward movement created by drilling or pumping a well.

MORE THAN ONE OIL SAND

It quite often happens that two or more separate oil sands will be encountered in the same well. If the oil appears in profitable quantity in more than one sand is there any way of producing from the different sands at the same time and thus get the benefit of both?—N. E. T.

This is a very general question, because each field has its own peculiar sand conditions that must be considered and no rule will cover all producing areas.

In the first place it must be made clear what is meant by "separate oil sands," for the productive portion of all sand bodies is in reality divided into innumerable zones of porous material that can be saturated with oil and strata of impervious material above and below the productive streaks.

The width or thickness of these productive strata will vary greatly with the different oil fields, and in California where there are oil sands of great thickness they make a practice of setting perforated pipe opposite the oil sand bodies with blank pipe in between. This is also done in the Gulf Coast fields.

However, in Tonkawa and other fields there are several different producing zones separated by several hundred feet or more of barren material and there it is common practice to drill separate wells to each of the more profitable sands and produce from each, but other sands that are not so productive may be handled through the inner string of casing, which is ripped opposite the sand to admit the oil.

Another method is to drill the well to the lowest producing oil body and extract that oil and then plug the hole and come back up the casing to the next lower sand and rip the pipe and produce from that sand, and repeat this all the way up the well until all sands are depleted. The fact that the gravity of oils from the various sands will vary enough to make a price difference is sometimes the deciding factor in determining whether it shall be produced through one well or through separate wells, known as "two spots," "three spots," etc.

With rotary drilling many of the smaller sand bodies are mudded off when the well is drilled and if it is necessary or desirable to produce them later new wells must be drilled; for as a usual thing no definite record is kept of the depth or thickness of these sands. However, it is possible to core such sand bodies and make tests for production if it is considered desirable.

VAPOR TENSION AND PRESSURE

Will you explain to me please the meaning of the words "vapor tension" and "vapor pressure"? I find them in an article concerning gases.—N. U. L.

Dr. Frank E. E. Germann, of the University of Colorado, provides the following definitions of these terms: "The measure of the tendency of a liquid to become a vapor is called the vapor tension. The pressure of the vapor which has escaped from the liquid is called the vapor pressure. As the temperature is increased the vapor tension of the liquid increases until a point is reached at which the vapor tension slightly exceeds the external pressure (usually the atmospheric pressure) on the liquid surface. At this point the liquid passes freely into the vapor state and is said to boil."

HELIUM IN NATURAL GAS

Will you be so kind as to inform me about the existence of helium in natural gas? I would like to know something about its extraction and use. Please mention the best publications on this subject.—G. C.

Limitations of space prohibit any extended discussion of the origin, extraction and use of helium. The chief sources of helium are the natural gas fields of Petrolia, Tex.; central Potter County, Texas, and a district near Dexter, Kans.

The helium content is extracted by subjecting the natural gas to a pressure which liquefies everything but the helium. Thus it is possible to pump off the helium.

Helium is the most satisfactory known gas for the inflation of dirigibles, in the construction of which great advances have been made in recent years. Although its lifting power is not so great as that of hydrogen, it is inert, while hydrogen is highly inflammable, making its use much more hazardous. Other uses are being discovered for helium. One of them is decompression for men who work under water.

It is suggested that you obtain a copy of the Bulletin of the American Association of Petroleum Geologists, Volume 13, No. 7, July, 1929, which contains an article on "Helium. Its Probable Origin and Concentration in the Amarillo Fold, Texas," by Paul Ruedemann and L. M. Oles. You are advised also to read an article, "Production of Helium Commercially," in The Oil and Gas Journal of June 16, 1927, by Richard B. Moore, dean of science, Perdue University, formerly in charge of helium work for the United States Bureau of Mines.

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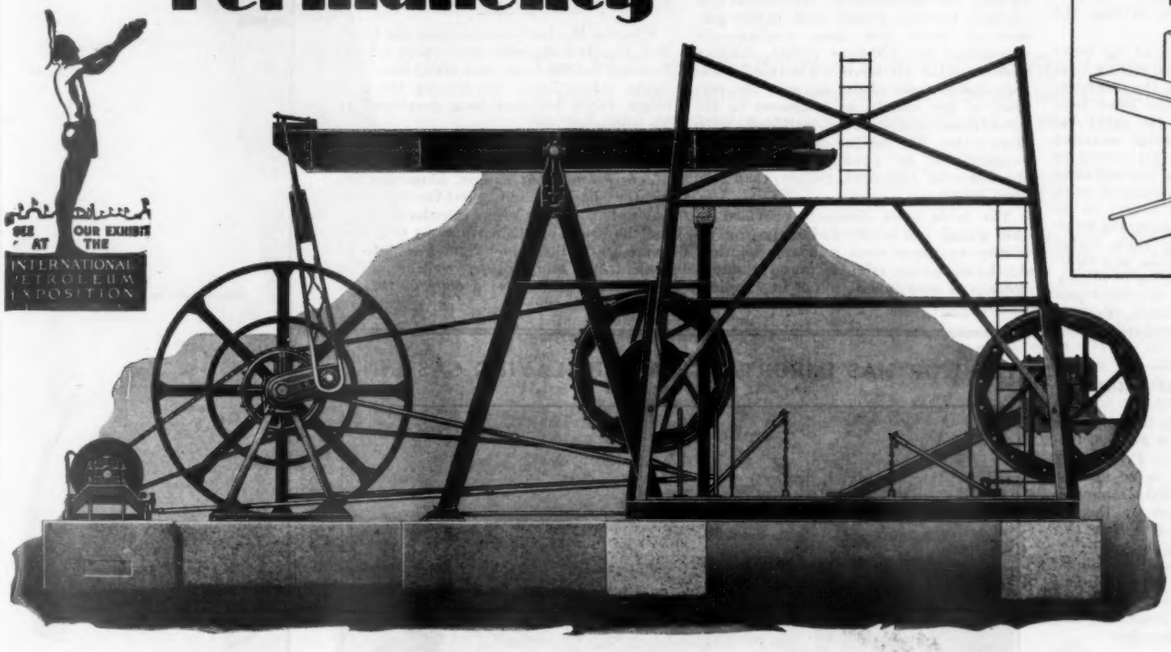

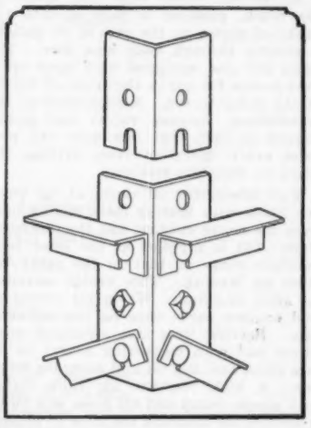

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Parkersburg All-Steel Rigs, with Structural Steel Derricks and the necessary steel component parts, offer to the Oil and Gas Industry, definite economies in fewer replacements, lessened wind load, removal of fire hazard, quick assembly, portability and everlasting satisfaction.

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EQUIPMENT AND SUPPLIES

BUTLER REFUELING UNIT DOES ITS WORK RAPIDLY

Butler Super-Service refueling units are capable of refueling the largest trimotored planes in 5 to 15 minutes, according to the Butler Manufacturing Co., Kansas City, Mo., and Minneapolis, Minn.

By power, taken from the motor of the truck, gasoline is pumped into the tanks of planes at the rate of 35 gallons a minute through each hose line. The units are also equipped with hand operated pumps for use in the event of failure of the motor power. Arrangement of the manifolding, by-pass valves and power control is such that one man can perform every operation from driving the truck to complete servicing.

Two lubricating oil tanks at the front are fitted with heating coils, taking heat from the motor exhaust and the thermometers. Oil is supplied at the same temperature range as that in the plane engines on landing. This avoids warming up after re-oiling. Warm oil served to cold engines saves time on the warming pan. Service lines are equipped with filters and with measuring meters to insure clean fuel and oil and accurate measure. A high pressure air tank, fitted with gauge, pump and air hose, is a built-in feature for inflating the tires of planes. Safety valves are provided to afford protection against excess pressure, vacuum and fire. Hand fire extinguishers provide additional fire protection.

SHAFFER CO. BREAKS GROUND

The Shaffer Specialty Co., Tulsa, broke ground this week for its new $40,000 factory at King Street and the Frisco railroad tracks. The plant is to be modern in every detail, giving greater manufacturing facilities necessitated by the increased business of the Shaffer Bear Cat hoists. The building is to be of brick, concrete and steel with well appointed offices, and is expected to be open about October 1. E. J. Shaffer is president; George Shaffer, secretary-treasurer, and Harry F. Hinnish, sales manager.

HAS OKLAHOMA CITY BRANCH

The Donner Engineering Co. has opened in Oklahoma City for the convenience of operators in that field an office in 1616 Petroleum Building and a warehouse where a complete stock of Donner low-pressure gas burners will be kept. Special burner requirements will receive prompt attention, according to C. E. Grimes, who represents the company in Oklahoma City, and there will be day and night service from the warehouse. The company's general office and factory are in Tulsa.

TRADE LITERATURE RECEIVED

Additional features for reducing drilling costs are explained in a bulletin prepared by Wilson-Snyder, Pittsburgh, Pa., showing the company's long-stroke direct-flow slush pump for high-pressure drilling.

The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is distributing a leaflet describing its 300-ampere gas-engine-driven arc-welding set.

A bulletin illustrating and describing the EC&M controllers is being sent out by the Electric Controller & Manufacturing Co., Cleveland, Ohio.

"Dependability in Steel Castings" outlines the more important steps which the Sivyer Steel Casting Co., Milwaukee, Wis., has taken in the last 20 years to control the variables in steel casting production and quality. Copies are available for the asking.

EVINRUDE CENTRIFUGAL PUMP TAKES HARD TEST

An Evinrude twin-cylinder centrifugal pump has just completed an endurance test conducted to determine the percentage of sand, gravel and mud that could be pumped with this pumper. A platform at an elevation of 8 feet was built, and upon this the pump was mounted. Sixty per cent water with 40 per cent mixed sand, gravel and mud, according to weight, was the test solution.

As far as Evinrude engineers could ascertain, this is the heaviest solution of "mud" ever pumped by a gasoline-driven portable centrifugal pump. At a head of 10 feet, the twin-cylinder centrifugal discharged between 10,000 and 12,000 gallons of water per hour continuously throughout the 100-hour period, running each day for 10 hours. The mud solution slowed down the pump only 200 revolutions per minute as compared to the revolutions per minute attained with clear water. The cooling of the pump was accomplished by running city pressure through the cylinders rather than the mud solution.

The wide open channels provided in this pump are credited largely for its ability to pump such a heavy solution. At the end of the trial the pump was torn down and pronounced to be in excellent condition.

BUSINESS NOTES

The Wagner Electric Corp., St. Louis, Mo., has transfered F. C. Hosimer from the St. Louis home office to the Chicago branch sales office, where he will represent the company as a salesman.

E. J. Schwanhausser, for two years assistant manager of the Harrison works of the Worthington Pump & Machinery Corp., has been appointed manager of that company's Buffalo works. Only 35, Mr. Schwanhausser is one of the youngest executives in the Worthington organization, whose employ he entered while yet a student at Stevens Institute of Technology.

Charles Markey, representing the Link-Belt Co., Indianapolis, Ind., spent several days in the Seminole and Oklahoma City fields, where he is introducing the new chain which has just been developed by his company.

Oil Service Equipment, Chicago, manufacturers of float gauges, aluminum indicator boards and steel-faced gauge poles, has an oil price calculator showing the prices of oil in fractions of a cent up to 100 gallons, and from 1 cent to 50 cents. Any oil company writing on its letterhead will receive a copy of this oil price calculator.

TRACTOR HAS IMPORTANT PART IN LAYING GAS LINE

Through mud and sand this unit pushes the line ahead.

The importance of tractor power in the oil and gas industries is being demonstrated again in the construction of the Mississippi Fuel Corp.'s pipe line from the Monroe-Richland natural gas fields in Louisiana to the industrial section of St. Louis, Mo. This is one of the second largest pipe line projects ever undertaken in this country—475 miles of 22-inch pipe—and almost all of the operations are being performed with tractor pipe-handling units.

The Oklahoma Contracting Co., of Dallas, Tex., which is laying a section of this line, has a fleet of 15 Trackson McCormick-Deering crawler tractors, some with Seminole pipe-laying booms and others with Seminole hoists working on the job. With this equipment the contractors have pushed the line ahead rapidly in spite of difficult ground and weather conditions. High water throughout the country where they are working has made low places and swamps practically impassable with any equipment except crawler tractors.

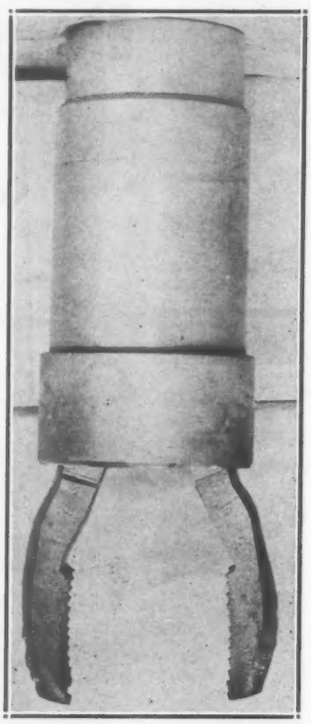
Most of the operations necessary are performed by these tractor units—hauling, stringing, stabbing, and lowering in the pipe, pulling river, road, and swamp crossings, backfilling, heaving loads of pipe and other supplies out of mud and sand where the trucks are unable to proceed under their own power, etc. The pipe for this job comes through in 40-foot lengths, and the Seminole booms handle and place these big joints. Pipe line superintendents estimate that one of these units, together with two or three men, easily replaces a gang of 15 to 20 on lowering-in work.

Working on the other end of the Mississippi Fuel Corp.'s line is another fleet of Trackson McCormick-Deerings with Seminole hoists and pipe booms, which are owned by Williams Brothers of Pine Bluff, Ark., another well-known firm of pipe line contractors.

Trackson full-crawlers are manufactured by the Trackson Co., Milwaukee, Wis., and the Seminole equipment is put out by the Muskogee Iron Works of Muskogee, Okla. The Resistcor Engineering Corp., of Tulsa, is distributor for these lines.

NEW TYPE SCREW GRAB IS OFFERED BY BAKER

A new type of screw grab is announced by Baker Oil Tools, Inc., Huntington Park, Calif., which recently acquired the manufacturing and sales rights on the entire line of Marvel fishing tool specialities. The Baker Marvel screw grab has been redesigned and strengthened and is now ready for the market. The various types of jaws will take care of requirements in fishing for



flat fragments, picking up fishtail bits, nuts, etc., and round corner fish, as well as various other types of fragments.

The grab is connected by the proper size of sub to the drill pipe size. When it rests on the fish, the weight of the drill pipe will collapse the jaws of the grab by forcing the threaded stem up into the slip nut. After the fish has been secured, a tighter grip is taken on it by rotating the drill pipe to the right until proper grip has been obtained.

The main body of the Baker Marvel screw grab is made of 1,035 SAE carbon steel. The jaws are of 6,140 SAE. All parts are heat treated and hardened where necessary. The screw has the buttress type thread. The grab is to be made in all sizes to order, up to and including sizes to fit a 16-inch casing, and with an outside diameter spread of the jaws to approximately 18⅝ inches.

ARNOLD MADE SALES MANAGER

W. H. Arnold, formerly assistant sales manager of the Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa., has been appointed general sales manager, succeeding C. A. Anderson, Jr., who became president of the company March 1. Mr. Arnold's association with Pittsburgh Valve dates back to 1905. For 12 years he worked in various departments of the plant, acquiring a thorough knowledge of the business. Since 1917 Mr. Arnold has been engaged in sales activity.

The Most Important Equipment In Any Rig!

Two H. C. Smith efficiency tools that are vital factors in drilling operations — assuring the maximum of safety, speed and economy under all conditions of service.

The New H. C. Smith Type "C" Demountable Drilling Bit. (Drop Forged.)

The newest development in drilling bits which embodies several new features of blade and tooth position, which have proved especially effective in making faster, straighter hole in all types of formations. It has the same carefully designed serrated features of the H. C. Smith Type "B" drilling bit, allowing easier penetration of either hard or soft formations. The use of this drilling bit will reduce operating costs and introduce greater efficiency in drilling methods.

The H. C. Smith Type "C" Coring Outfit.

This Coring Outfit is in daily use wherever cores are taken. It will take perfect cores in any formation that a fishtail or disc bit will penetrate. Renewable cutterheads can be changed in a few minutes and economically discarded when worn. It is simply designed and constructed of drop-forged high carbon steel throughout. For efficiency and low cost of operation it is unequalled by any other type of coring outfit.

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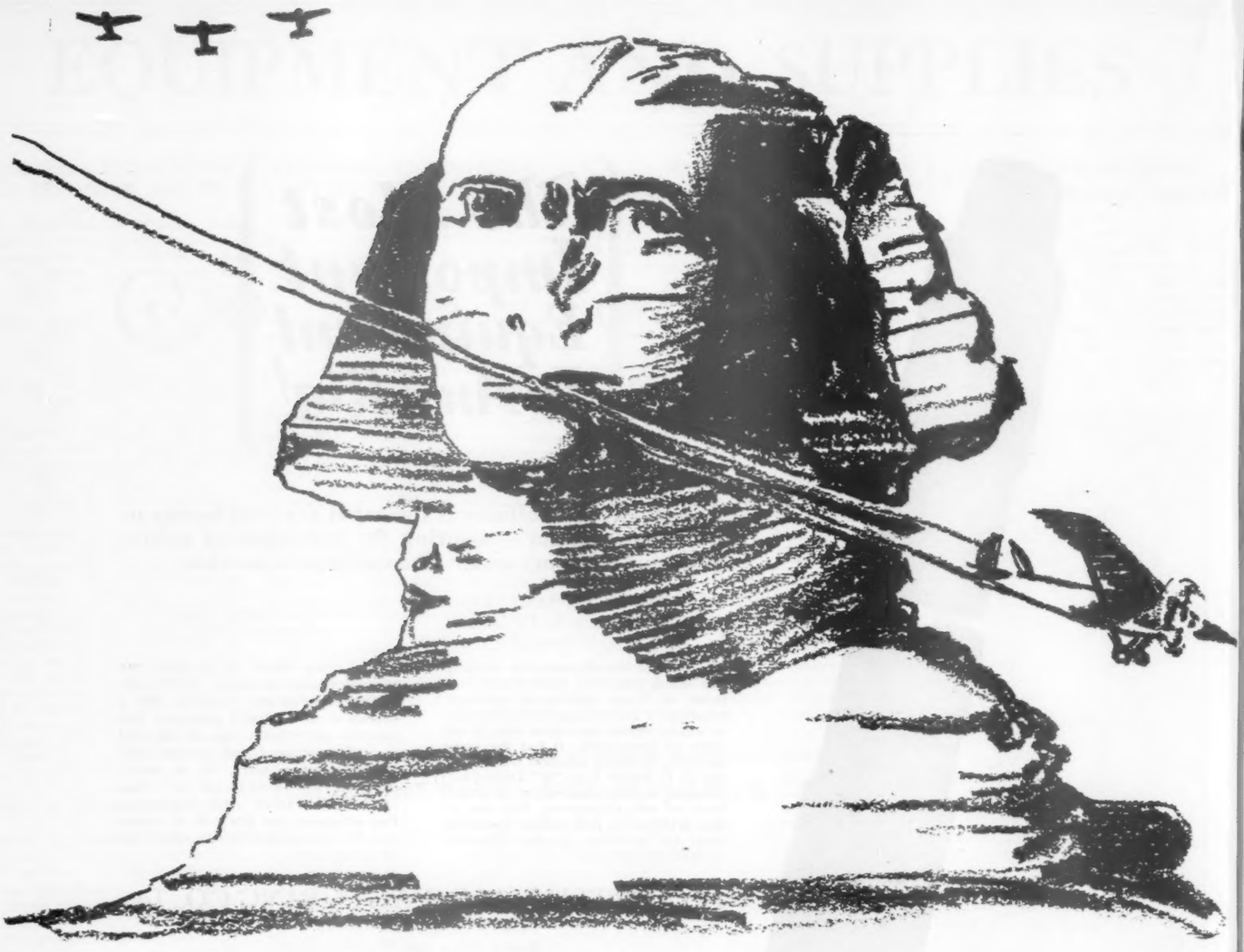
Complete data free upon request.



PROGRES

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BE SQUARE TO YOUR MOTOR

Leadership writes her history in the few

From the very beginning of achievement, leadership has been the coveted prize of the pioneer . . . the true tribute of those who have gone forward in step with progress.

In the front ranks of those who can be truly called the leaders in the Petroleum Industry, Barnsdall occupies a position that is not held by length of service alone—but is the reward of an unceasing desire to serve . . . *by making better what was already good.*

Such petroleum products as SUPER-GAS the non-poisonous Anti-Knock Motor fuel and BE SQUARE Motor Oils exemplify this leadership, in the millions of motorists who daily use them and in the thousands of Barnsdall Jobbers and Dealers building successful and prosperous businesses through this public preference for the BE SQUARE.

* *In 1860, William Barnsdall, father of T. N. Barnsdall, the founder of BARNSDALL, established the world's first oil refinery.*

FIRST* REFINER

CHICAGO NEW YORK ST. LOUIS KANSAS CITY ST. PAUL LOS ANGELES

Natural Gas Developments

HELIUM OUTPUT GROWS IN ARMY'S TEXAS PLANT

The Government's new helium plant at Soncy, near Amarillo, Tex., produced in July 648,850 feet of helium at an average purity of approximately 97 per cent, according to the Bureau of Mines. Production has been increasing steadily since the first shipment on May 6.

With practically the same fixed charges as at present the production can be increased, when the second unit of the plant is completed, it was stated, to any desired amount up to 20,000,000 feet or more per year, and at the cost per 1,000 feet of helium will depend on the amount of orders received.

Detailed costs are not yet available, but it is believed the production costs at the new plant will be well within the previously estimated figure of $20 per 1,000 feet. This is the lowest figure at which helium has ever been produced, so far as known to the Bureau of Mines.

When the second unit is completed in the near future the normal capacity of the plant will be far in excess of present operations. The average cost of helium produced at Fort Worth, Tex., during 1926 was $34 per 1,000 feet.

Compared with this figure a cost of $20 per 1,000 feet effects a saving of approximately $36,000 in the helium required for a single filling of the Los Angeles, or $91,000 in the cost of the 6,500,000 feet required to fill one of the big ships now under construction for the Navy.

Shipments of helium are now being made regularly from the Amarillo plant in specially designed tank cars to the Navy at Lakehurst and to the Army at Scott and Langley Fields for use in the dirigibles.

ST. THOMAS GAS PROJECT

CHATHAM, Ontario, Aug. 26.—The St. Thomas City Council has asked Maj. R. B. Harkness, Natural Gas Commissioner for Ontario, to confer in regard to a proposal of the Central Piue Line Co. of Chatham to sell natural gas to the municipal distributing plant. It is proposed to lay a pipe line to deliver natural gas to St. Thomas at the city limits, the supply being drawn from the Vienna and Richmond Fields in Elgin County. A tentative agreement already made between the city and the company calls for a rate of 55 cents for the first 50,000,000 feet, 45 cents for amounts between that figure and 250,000,000 feet, and 40 cents for any excess amount delivered in any one year.

VISALIA SOON TO HAVE GAS

VISALIA, Calif., Aug. 26.—Natural gas will be available in Visalia about the last of September, according to F. M. Banks, manager of the Southern California Gas Co. The line is being laid at the rate of about a mile per day. It should be completed about September 1, and the company expects to give Visalia and Hanford gas about two weeks later. The present plants in Visalia and Hanford will be kept for stand-by service only, it is said, and used in event of a break in the line. Gas to be used comes from the Kettleman Hills.

MANY NEW USES FOR GAS

Many new uses for gas in industry have recently been discovered. The first gas-fired manganese steel annealing oven installed in Chicago—a giant piece of heating equipment capable of handling several tons of steel at a time—was put into operation last year. It is working with such efficiency that an order has been placed for installation of another. This opens an attractive field for the sale of the companies' product in large quantities.

PETROLIA STILL IMPORTANT POINT IN GAS DISTRIBUTION IN TEXAS

FORT WORTH, Tex., Aug. 24.—One ot the oldest gas and oil fields in the Southwest is the Petrolia Field in Clay County, Texas. The present large Lone Star Gas system had its beginning in this field, and is still active producing and supplying gas to many towns in the vicinity. It also carries several million feet of gas to Fort Worth and Dallas daily from the Petrolia area.

The Lone Star Gas Co. went into the field in 1909, starting its operations by laying a 3-inch line to Henrietta and Wichita Falls, Tex., and about the same time constructed a 16-inch line to Fort Worth and Dallas. Gas was delivered into Forth Worth in the early part of 1910 and in May of the same year it was turned on in Dallas. The system was supplied by well pressure until 1914, but the company had expanded to such an extent by that time that it was necessary to build a compressor station to boost the pressure to all points then being served by the company.

The Petrolia Field was the logical place for the compressor station, so in October, 1914, the first Snow engine gas compressor was put into operation and four more of the same type were installed later, all of them still operating. The accompanying picture shows the Snow engines at the Petrolia plant. This battery is capable of developing a total of 7,000 horsepower, and on cold days in the winter are all kept busy boosting gas to the towns and cities now being served in Oklahoma and Texas by the company.

The Lone Star Gas Co., while drilling for water on the Lockridge farm in the Petrolia district, went into oil and thus opened the field. The first gas well was the No. 1 Miller, with a rock pressure of 650 pounds, and one of the most spectacular wells of the field was this well which blew out and was not brought under control for 59 days.

Early Day Casinghead Plant

In 1911 a gasoline content test was run on gas from the Smith No. 1 Weber, which resulted in the company building an experimental gasoline plant at the Petrolia station in the early part of 1916, and this resulted in the erection of a permanent gasoline plant that year. The accompanying pictures shows the various plants, also the cottages, hotel and office buildings in the camp.

Seven Years' Production

From 1922 to May, 1929, inclusive, 11,153,499,999 feet of gas have been taken from the Petrolia Field, and from 1919 to 1928, inclusive, there have been 27,411,632 gallons of gasoline produced at the plant. The gasoline plant started operating October 21, 1916, and on October 26, its first car load of gasoline was shipped to the Pierce Fordyce Oil Corp. There are at present 54 wells connected in the field, producing approximately 60,000,000 feet of gas per month, and drilling for oil and gas continues on the 9,500 acres which comprise the field.

Importance in War Time

This field played an important part during the war when the United States Government, after examining gas from practically every field in the country, discovered that natural gas from the wells of the Lone Star Gas Co. at Petrolia had a greater helium content from a commercial standpoint than any others. A number of other fields registered a larger percentage of helium but the quantity of gas was not sufficient to make its extraction profitable elsewhere than at Petrolia. Samples from virtually every well in the field were taken before the Government decided definitely to use Petrolia gas for the manufacture of helium, and when it was determined to use this gas, a 10-inch pipe line, 100 miles long, was laid to Fort Worth, at a cost of more than $1,000,000. Two experimental plants were erected near Fort Worth, one being operated by the Air Reduction Co. and the other by the Linde Air Products Corp. Both of the plants made helium. The Linde plant remained in operation until April 1, 1929, when it made way for a more modern plant operated by the United States Bureau of Miles at Amarillo.

Julian Foster, engineer of the Lone Star Gas Co., was plant operator at Petrolia and was of substantial aid in the development of the United States helium plants. At that time the United States Bureau of Mines maintained one of the best helium laboratories in the United States, at Petrolia. The employes of the Lone Star Gas Co. played an important part in helping the Government by maintaining a continuous supply of gas going to the plants. The operation of the plants depended upon a uniform and continuous delivery of gas through them, and any interruption of service interfered with their cycle of operation, causing as much as a three or four-day shutdown, because an excessive amount of liquid would flood the exchanger and expander and coat the exchanger tubes with frozen carbon dioxide. It would require 24 hours to cool the plant down to where the insulating legging could be moved to get into the tubes to clean them, and about 24 hours to clean out and tighten up joints that were loosened by the warming-up process, and an additional 24 hours to get the plant temperature down to operating points after the plant was started up. The Lone Star engineers and scientists also helped with the intricate and delicate processes necessary to produce helium, and the company made improvements in its gasoline plants in order to completely extract the hydrocarbons composing natural gas. If this is not done, these hydrocarbons condense in the first phase of extraction and tend to clog the apparatus.

Applying Refrigeration

Elmer F. Schmidt of the company conducted many experiments at Petrolia as a forerunner to the building of the helium plant. One of these experiments involved the application of refrigeration to mineral seal oil to more completely denude the gas of gasoline hydrocarbons. The experiment showed an increased recovery of gasoline of between 50 and 75 per cent. On the strength of these experiments a large refrigeration plant was built in this field, and another in Oklahoma and several in the East to increase the efficiency of gasoline plants.

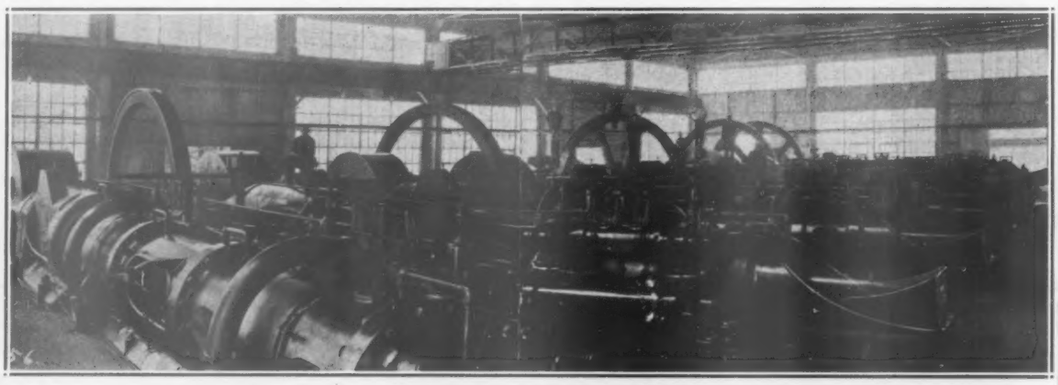
Great Reduction in Cost

The Jeffries-Norton helium plant at Petrolia, which was supported by the Bureau of Mines and the Army and Navy, operated until about 1921 when it was dismantled. The original cost of manufacturing helium was about $2,000 a cubic foot but the development of commercial processes has reduced this cost to approximately 4 to 6 cents a cubic foot. This drop in the cost of manufacturing helium is of great benefit in the building of dirigibles and semi-dirigibles by the Army and Navy. One of the latest of these being built by the Navy, to be called the ZRS-4, will dwarf the Graf Zeppelin and will have a nominal gas volume of 6,500,000 cubic feet. The Los Angeles, our largest dirigible at present, handles a nominal volume of only 2,470,000 cubic feet, and the Graf Zeppelin has a nominal gas volume of 3,700,000 cubic feet. The United States

(Continued on Page 322)

OIL PIPES MAY CARRY GAS

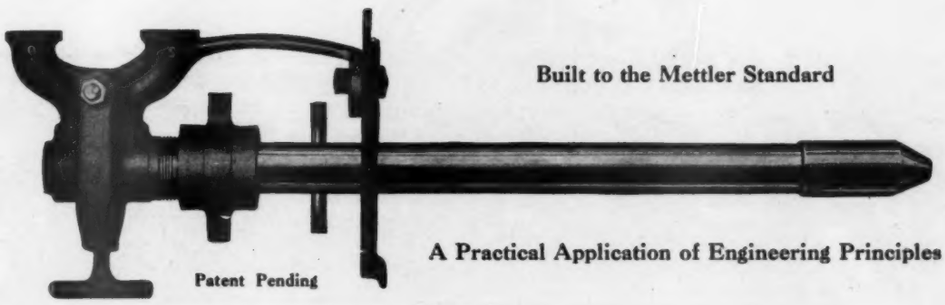
OLEAN, N. Y., Aug. 26.—Natural gas from southwestern New York, northwestern Pennsylvania and Ohio may be piped through Olean to cities and towns along the southern tier as far as Binghamton, according to a petition filed with the Public Service Commission in Albany by the Columbia Gas & Electric Corp. of New York and requesting authority to purchase outstanding common stock of the Binghamton Gas Works. The gas is to be carried to Binghamton through pipe lines recently acquired from the New York Transit Co. and previously used for moving oil. The Columbia company stated that it owned and operated 23,000 miles of natural gas mains and that it had tested those in southern New York and found them ready for use.



Interior view of Lone Star Gas Co.'s compressor plant at Petrolia, one of the most important in the company's big system. The Lone Star maintains 100 employes at this point.

Announcing
The METTLER

Quick Detachable Oil Burner



Built to the Mettler Standard

Patent Pending

A Practical Application of Engineering Principles

External Atomizing

The Mettler Wide Range, Quick Detachable, Steam, Air or Gas, Atomizing Oil Burner is an outstanding achievement well worthy of your serious consideration.

Detailed descriptions of superiorities have become superfluous. However, we have seen this burner operating where top of oil in gravity tank was only 4 feet above burner, steam pressure of 4 pounds at burner, two burners in use, operating 450 H. P. Boiler at 200% rating, and same burner operating successfully 80 pounds on oil, 125 pounds steam on 15 H. P. Boiler. While in operation fully adjustable, integral within itself, regardless of gravity or pressure on oil or when using steam, high or low pressure air, or gas as an atomizing agent.

Designed and constructed on absolutely correct scientific and practical engineering principles, is made of the best materials and impeccable workmanship obtainable, (bronze and brass) without a single compromise or excuse whatsoever.

Built to a standardized quantity production that allows us to quote exceptionally low prices.

It is a significant fact that the Mettler Gas or Oil Firing equipment is rarely subjected to unfavorable criticism.

Mettler Quick Detachable Oil Burners are made and sold by the manufacturer of the celebrated METTLER ENTRAINED COMBUSTION GAS BURNERS.

We Welcome an Opportunity to Serve

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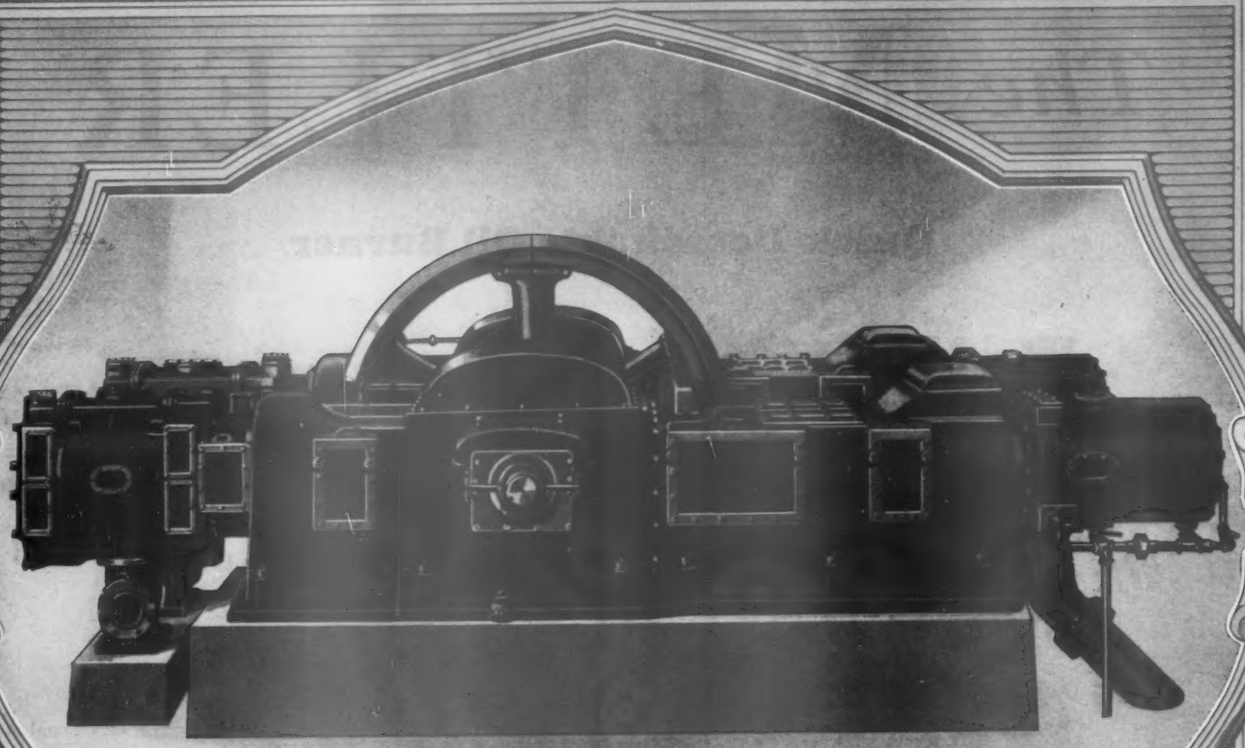
Please quote Prices on the equipment for the following:

No. of Boilers.....
H. P...... **Make**.....
No. of Stills.....
Size..... **Type**.....
Name.....
Company.....
City..... ***State***.....



Two-cycle simplicity means lower operating costs for both labor and maintenance.

COOPER BESSEMER CB CORP.

The low investment cost of Type-10 is important in considering ultimate profits.

Do You Know All the Advantages of The Bessemer Type-10?

THE Bessemer Type-10 gas injection, two cycle engine has advantages which can be expressed in dollars saved and more dollars earned by anyone who has a gas compressing job.

The gas injection principle gives it a fuel economy nearly equal to the best four cycle practice. Semi-steel castings, alloy steel and forged parts are but suggestions of the quality built into it. Finally it is being marketed by one of the oldest and most responsible machinery builders in the country. Manufactured on a quantity basis these compressors can usually be shipped from stock.

For a more detailed story of Bessemer Type-10's call for a Cooper-Bessemer engineer.

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Formerly The C. & G. Cooper Co. and The Bessemer Gas Engine Co.

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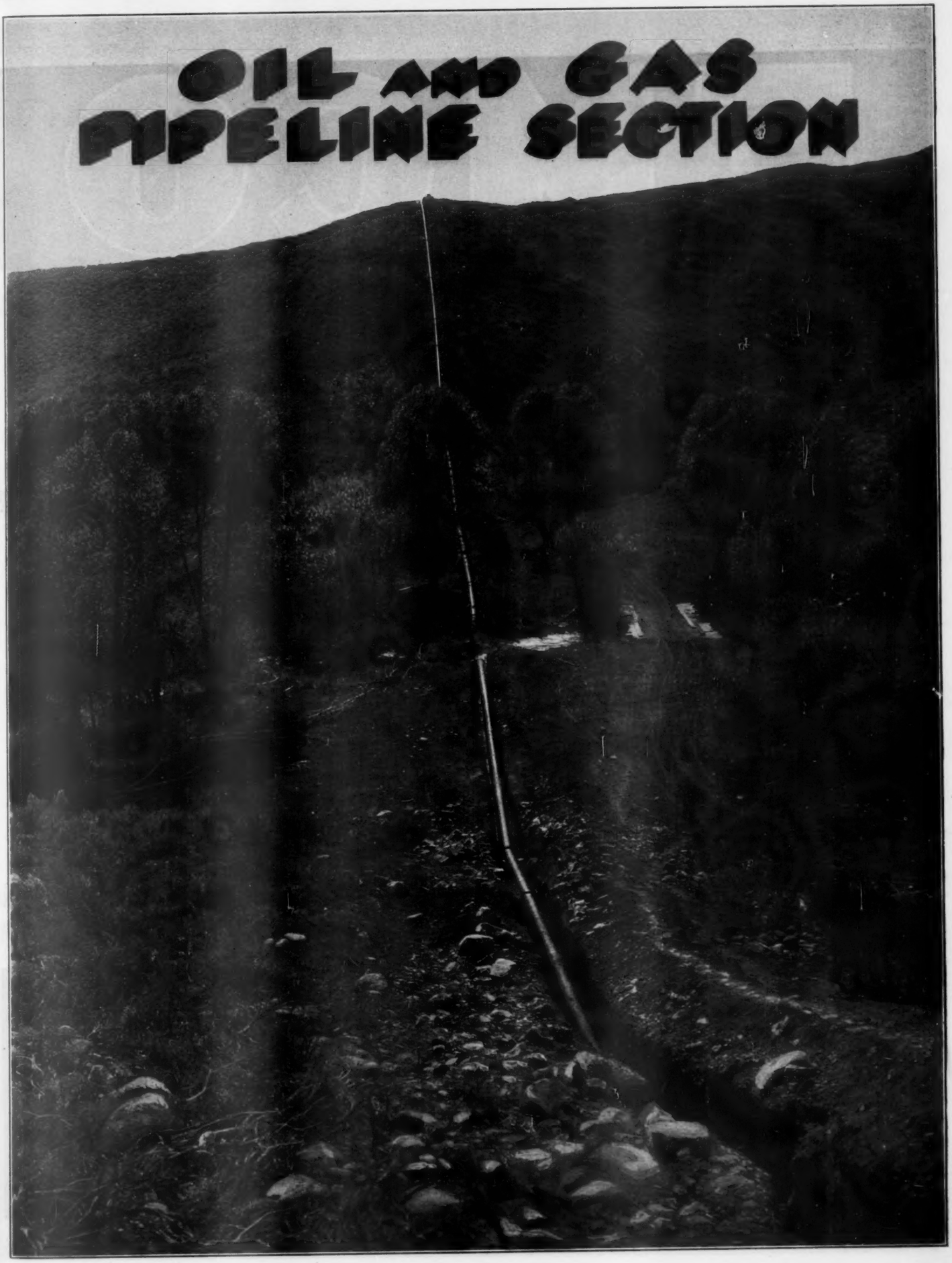
Branches in all the principal oil and gas fields

OIL AND GAS PIPELINE SECTION



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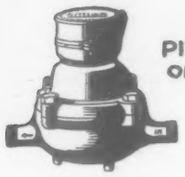
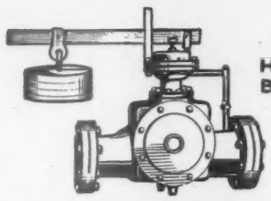


PITTSBURGH
OIL METER



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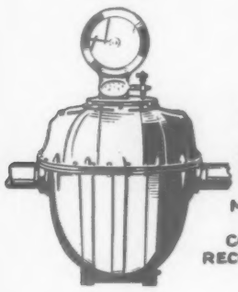
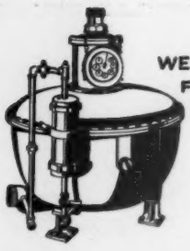
HIGH PRESSURE
BALANCED VALVE
REGULATOR

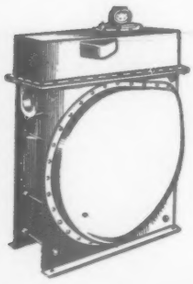
EMCO
ORIFICE
GAS METER



EMCO
LARGE
CAPACITY
CAST CASE
DRY GAS
METER WITH
EMCO
COMBINED
RECORD GAUGE



WESTINGHOUSE
FLUID POSITIVE
GAS METER



EMCO #5
PRESSED
STEEL TYPE
DRY GAS
METER

FOR over forty years Pittsburgh Equitable Meter Company products have been helping to solve the Transportation Problems of the gas and oil industries. Constant research and earnest endeavor to better their service have made this company the largest in the world manufacturing meters and regulators for the gas, oil and water industries, and the only company manufacturing a full line of both. Whether your problem is one of measurement or regulation, there is an EMCO pro-

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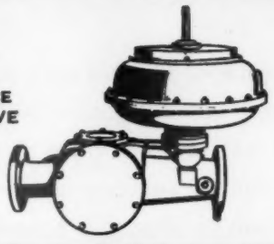

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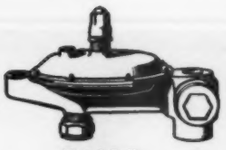
LOW PRESSURE
BALANCED VALVE
REGULATOR



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EMCO
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duct to fit your need. From the time your product leaves the well and on through the mains, branch distribution or domestic service lines, EMCO meters and regulators are giving uninterrupted service to hundreds of public utilities and their customers.

"EMCO—WHEREVER YOU GO", and a chain of branch offices and warehouses to assure prompt delivery, make The Pittsburgh Equitable Meter Company the leader in the field.

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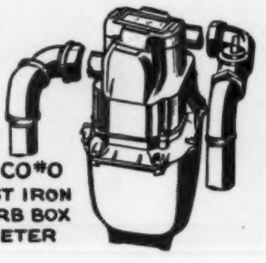
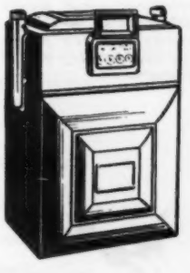


EMCO #0
CAST IRON
CURB BOX
METER

IRONCLAD
CAST IRON
DRY GAS
METER

EMCO
TIN
METER



PITTSBURGH EQUITABLE METER COMPANY

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TULSA SEATTLE KANSAS CITY SALT LAKE CITY

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Typical installation of three Worthington 4-inch 3-stage Centrifugal Oil Line Pumps. Capacity of each pump 25,000 bbls. per day at 375 lb. pressure.

Four Worthington 5½-inch x 18-inch Horizontal Duplex Forged Fluid End Oil Line Pumps installed in the Seminole Field. Capacity of each pump, 11,000 bbls. per day at 800 lb. pressure.

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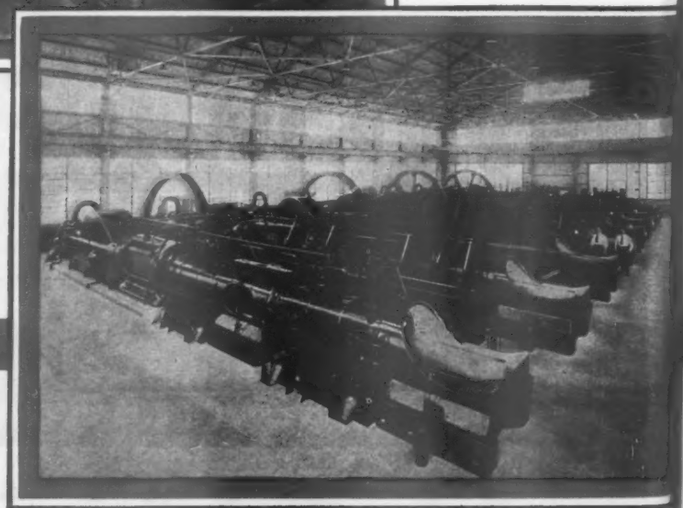

Four Worthington 25-inch x 48-inch twin-tandem four-cycle double-acting Gas Engine Gas Compressors at Fairbanks, La.

Oil and Gas Pipe Lines of the Country of the Oil and Gas Industries

THERE are two ways of looking at the value of Worthington equipment on the oil and gas pipe lines of the United States. The first is to count the actual cost of that equipment as installed; the second is to consider the value to the pipe line owners as measured in dependable and economical operation.

To say that the cost of Worthington equipment purchased for pipe line service aggregates many millions of dollars, does not give a true picture of the part that Worthington is playing in the pipe line field.

That cost must be translated into terms of values established by the pipe line men themselves. These men cannot afford to take chances. The oil and gas *must* move . . . no excuses are acceptable . . . the service rests squarely upon the equipment installed.

Installations of Worthington Reciprocating Oil Line Pumps are numbered in the hundreds. Seventeen prominent companies have installed over a hundred Worthington Centrifugal Oil Line Pumps. Many of the most important natural gas trunk lines, including the recently constructed lines which have attracted widespread attention in the industry, are served by Worthington Compressors, driven by Worthington Gas Engines.

The list of Worthington installations is growing steadily, and it is significant that notably well-managed companies are constantly adding to their Worthington equipment.

When planning new lines or modernization of present lines, *call in a Worthington engineer.* You will find him fully conversant with the requirements of your industry . . . and backed by a progressive organization whose wide range of products provides the solution to every oil and gas pumping problem.

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PIPE LINES
Williams Brothers Inc
ENGINEERS CONTRACT

Acting in the capacity of Engineers and Contractors, Williams Brothers, Inc., have the complete facilities for the construction of pipe lines of any type, size or length and are equipped and prepared for large projects.

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To better acquaint the Industry with our organization, its facilities and past records for efficiency and economy in the construction of oil and gas pipe lines, we are publishing this series of informative advertisements.

S. Miller Williams, Sr.
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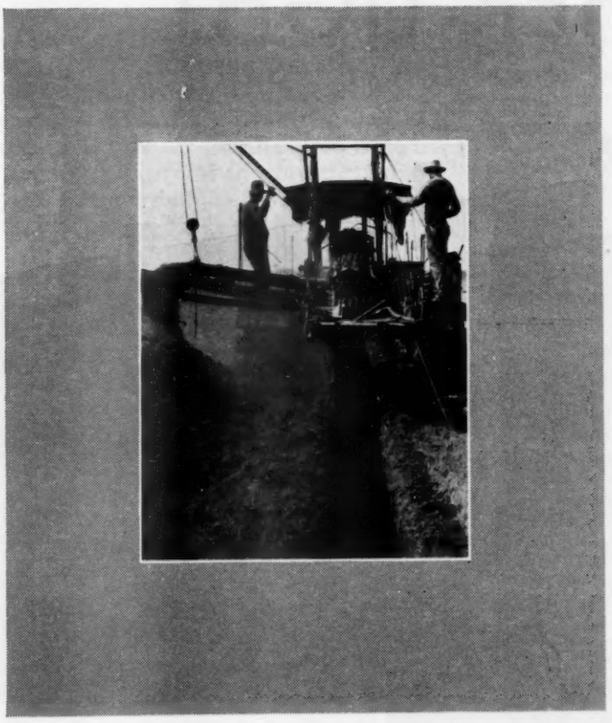
OF ANY SIZE, TYPE OR LENGTH



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OIL & GAS PIPE LINES

Williams Brothers have played an important part in the construction of some of the Industry's largest and most important oil and gas pipe lines. Prepared and ready to handle any pipe line construction job, we offer our past record as proof of what we are doing for some of the biggest names in the Oil and Gas Industry.

Williams Brothers Inc.
PIPE LINE CONTRACTORS
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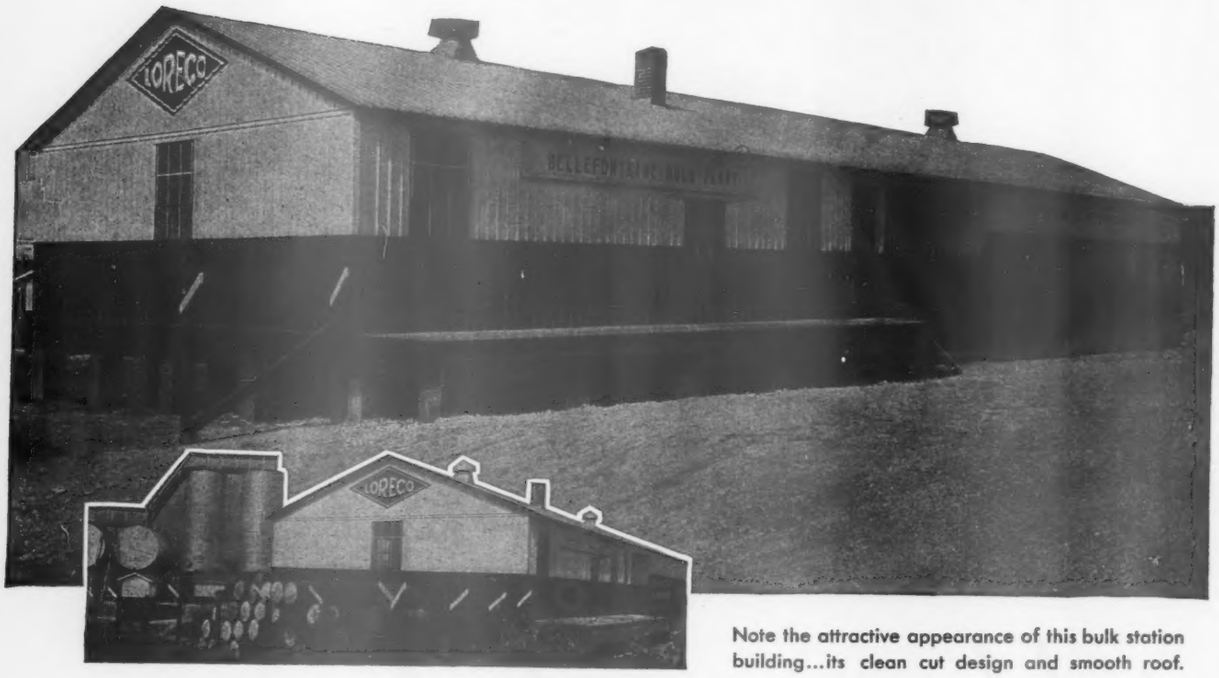

Note the attractive appearance of this bulk station building...its clean cut design and smooth roof.

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IDECO Buildings have all of the essential qualities of a modern industrial building. Designed to meet any one or two-story building requirement, they possess every essential feature carefully coordinated into strong, permanent, weather-tight and fire-safe buildings...IDECO Buildings meet modern business demands for economy in construction, flexibility of design, and complete protection against the elements.

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RUST RESISTING
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IDECO

Remarkable Expansion of Pipe Line Industry

By W. T. ANDERSON

The remarkable expansion of the pipe line industry continues to be the most spectacular feature of the development of the oil business. The growth of pipe lines, both oil and gas, in length of line and size of pipe, will be amazing to many in the other divisions of the petroleum industry who have not been brought into contact with actual pipe line developments. This Pipe Line Number of The Oil and Gas Journal will present for the first time a complete and comprehensive picture of the progress and achievements of the pipe line companies during the past year, the most remarkable period in the history of the industry.

The engineering difficulties which had to be overcome to make this expansion practicable can best be grasped by reading the technical articles contributed by the leading pipe line engineers and technologists in this issue.

Only a few years ago the transportation of natural gas, for example, a distance of 250 miles was regarded as wonderful. Lines have now been constructed delivering natural gas 400 miles from the fields and a system is being constructed to carry it 500 miles, while a project is under consideration for the transportation of natural gas 950 miles!

Primarily, of course, it was the great development of new oil fields that disclosed the immense reservoirs of natural gas which encouraged the construction of these great gas lines. These new oil and gas fields in West Texas were far removed from refineries and natural gas consuming centers and presented unprecedented problems in distant disposal.

The solution of these problems challenged the best thought and effort of pipe line engineers and the manufacturers of pipe line equipment. One of the most difficult was encountered in the arid areas of West Texas—the lack of water. This was met in two ways. The extension of electric power lines and the electrification of pipe line equipment was one. The other was the development by one company of a water circulating cooling system in which there is no evaporation, requiring only 10 barrels of water for the entire cooling system of a station using oil engines.

Two incidents indicate the physical difficulties encountered in the construction of pipe lines in West Texas. In one case it was necessary to lay a line through 15 miles of solid rock. In another water for cooking and drinking cost $8 a barrel.

Matters like these, however, were only incidental compared to the technical problems presented to the engineering staffs. Pipe line engineers have made great progress in the designing of lines for the most efficient handling of the various types and viscosities of crude oil. The manufacturers of equipment have been no less competent in adapting their pumps, pipe and other equipment to the transportation of oil and gas under changed conditions and over great distances.

Corrosion, long a problem of immense difficulty and complication, is now engaging the collective study of the engineers in co-operation with the Government's scientists, the American Petroleum Institute and the manufacturers of protective coatings.

The pipe line construction companies have, on their part, solved many problems which have arisen in the building of long lines through desolate and arid regions, mountainous country and swamps.

It was this splendid demonstration of team work by everyone concerned, engineers, manufacturers and construction men, which has overcome all obstacles and set a new standard for the transportation of petroleum and natural gas by pipe line.

The wildcatters in oil and natural gas development hold a proud place in the history of the petroleum industry, but the pioneering work of the pipe line division has not always been adequately regarded. Production has usually been developed far removed from consuming centers and would have been practically worthless in the case of natural gas without the accompanying development of the pipe line systems.

In the case of oil, transportation without the pipe line would have been very expensive, so expensive in fact that there would probably have been no such development of the automobile today if the raw material for our gasoline supply had had to be transported like other commodities.

In acknowledging the essential part which the oil industry has played in putting a motor car in almost everybody's back yard credit should be given to the pipe line companies which have invested millions upon millions of dollars in the transportation of oil.

The millions of Americans who enjoy the convenience, comfort and cleanliness of natural gas heat are likewise indebted to the enterprise that has spanned whole states with networks of trunk lines and distribution systems. Some of these great trunk lines have cost between $18,000,000 and $35,000,000, an investment based on vision, scientific knowledge and years of practical experience.

The great chain of pipe lines which has been built and is being extended from West Texas to the Gulf has made that production of oil available to the refineries on the East Coast serving the most populous section of the country and contributing largely to our foreign trade in petroleum products, our second largest export business.

The big natural gas lines which have been extended from West Texas and the Texas Panhandle and from the Louisiana fields are serving or soon will be serving great cities and small communities which up until now never dreamed of enjoying the advantage of this natural fuel.

It will be found in the years immediately to come that the extension of natural gas lines through the southeastern section of the country will be a great factor in the industrial development of that area, just as has been proved wherever natural gas has been made available for industrial uses. The presence of cheap and convenient fuel has been responsible for the industrial growth of every section within reach of the pipe line.

The wide expansion of natural gas transportation lines in the United States is clearly shown in the wall map which is a part of this Pipe Line Number of The Oil and Gas Journal, incidentally the first map of this kind that has ever been published. Even at this time there is under consideration further extensions of these lines to great consuming centers not now being served. Mere distance is no longer a deterrent to the pipe line engineer who has extended the practicability of natural gas transportation from 250 miles to almost a thousand miles within the brief period of a very few years.

Natural Gas for St. Louis in November

Industrial Plants in That Area Will Be Served With Fuel From Fields of Louisiana. Line Crosses Many Rivers

By R. W. Miller

Construction is rapidly progressing toward completion of the Missouri River Fuel Corp.'s natural gas pipe line from the northern Louisiana gas fields to the St. Louis, Mo., district. At the time of writing this article, August 1, 1929, 45 per cent of the line has been completed, and by August 20, 1929, the date of this issue, it is estimated that 75 per cent will have been finished. The initial work on this line was commenced late in April, 1929, and it is expected that natural gas will be turned into the St. Louis district near the end of November, 1929. The completion of this pipe line will make natural gas available to industries in St. Louis, Mo., proper, as well as to other industrial plants in Crystal City, Mo., and East St. Louis, Granite City, and Alton, Ill. When within reach of the main line, other industrial consumers in many cities and towns of Louisiana, Arkansas and Missouri will be served.

Pipe covered with protective coating on right of way in Arkansas forest.

The main line extends from a point near Perryville, La., north through the States of Arkansas and Missouri to a point just north of the Meramec River in St. Louis County, Missouri, deviating from a strictly northerly route only where necessary to avoid unfavorable terrain. The distance traversed by the main line from Perryville, La., to its terminus near the Meramec River is 431 miles. This line is constructed in its entirety of 22-inch outside diameter steel pipe. Section gates are provided every 8 or 9 miles. At the southern end of the main line is a field line extending to near Alto, La., in the Richland Field, consisting of 25 miles of 16-inch outside diameter pipe. At the northern end of the main line near the Meramec River, the line branches, one branch going in a general northerly direction into the St. Louis, Mo., district. The second branch crosses the Mississippi River and continues on in Illinois to East St. Louis, Granite City and finally to Alton, where it terminates. In laying the two branch lines, 70 miles of 22-inch, 20-inch, 18-inch, 16-inch, 14-inch and smaller diameter pipe were required. The total distance in the main line, field line and two branch lines is 526 miles.

Pipe and Couplings

Approximately 300 miles of the main line steel pipe is electric welded, of five-sixteenths inch thickness, in 40-foot lengths. The remainder of the main line pipe is lapweld, of three-eighths inch and eleven-thirty-seconds inch thickness, in lengths approximating 19 feet. The field line pipe is lapweld, as well as the various diametered pipe used in the two branch lines. All of the line is of the Dresser type, more than 90,000 couplings being used for connection purposes. The weight of the pipe, couplings and clamps used in the entire system amounts to 115,000 tons. There were 4,435 cars of material shipped from various points for use in the construction work. Based on 45 cars per train, this would amount to 98 entire train loads.

It is of interest from the standpoint of cost of line maintenance to note that for a great percentage of the distance between Perryville, La., and St. Louis, Mo., the pipe line parallels the usual lines of communication, in this particular case, United States Highways 61 and 67. Such a condition makes the pipe line easier of access, an item often times of the utmost importance. This factor has not been given the greatest consideration in all previous pipe line construction.

For the purpose of preventing pipe corrosion, due to the action of moisture and certain types of soil, 310 miles of the line have been protected by coatings.

Right of way problems were both numerous and difficult, especially in the St. Louis district. In many cases, it was more a question of where one could go, rather than where one wanted to go. This is to be expected, though, when bringing a pipe line into as thickly populated section as the St. Louis district, where the acreage owned per individual is low. Approximately 1,600 right of way grants will be in use on the main line and branches.

To the casual observer, and on first thought with the average natural gas man, the laying of a pipe line through a section of the United States in the lower Mississippi River Valley presents few difficulties, in so far as terrain conditions are concerned; but the problem becomes more difficult when, after consulting a drainage map of the country, one realizes that the Mississippi River with its almost countless tributaries drains water from approximately one-half of the entire area of all our states. In addition to numerous bayous and smaller streams of water, eight principal river crossings were necessary in the construction of the St. Louis pipe line.

Eight River Crossings

These were all multiple line crossings and are over the following rivers at the locations indicated: Arkansas River, near Wilkins, Ark.; Little Red River, near West Point, Ark.; White River, near Newport, Ark.; South Black River, near Biggers, Ark.; North Black River, near Hendrickson, Mo.; St. Francis River, near Greenville, Mo.; Meramec River, near St. Louis, Mo.; and Mississippi River, near St. Louis, Mo. The total miles of all rivers crossed by the multiple lines is 4.6. Four lines cross the Mississippi River, with six each over the other seven rivers, or a total of 46 lines, requiring approximately, if laid end to end, 28 miles of pipe, the distance between headers. The river lines were all constructed of 10¾-inch outside diameter steel lapweld pipe. For the 46 lines, 2,598 collar leak clamps were needed, and 2,274 river clamps, each weighing 1,500 pounds, were used to anchor the lines in the river beds. The usual standard methods and equipment were employed in making the river crossings.

In addition to these major river crossings, multiple lines were also needed over the following: Deporte and Oak Creeks in Arkansas; Cane, Otter and Joachim Creeks in Missouri; Boeuf, Lafourche and Bartholemew Bayous in Louisiana; Des Arc Bayou in Arkansas; and Horse Shoe Lake in Illinois. The total distance covered through these smaller bodies of water is 2.7 miles. Both 10¾-inch outside diameter and 12.220-inch inside diameter pipe were used in this work, 11 miles of pipe, if placed end to end, being needed, as well as 894 collar leak clamps and 258 river clamps.

A company owned telephone system parallels the gas line from near Alto, La., to the Meramec station, near St. Louis. From that point to the city offices of the Mississippi River Fuel Corp., service is obtained over a leased commercial system. The telephone poles average 30 to the mile, and carry one pair of wires. In addition to the installations at the five compressing stations and at other points, pole boxes are located at each section gate, these being from 8 to 9 miles apart. Cut-ins may be made from these pole boxes on to the main telephone line. The chief gas dispatcher will be located at the Meramec pressure reducing station, near St. Louis, Mo. It is planned to employ the usual hourly checking system between the compressing stations and the chief dispatcher.

Five Compressor Stations

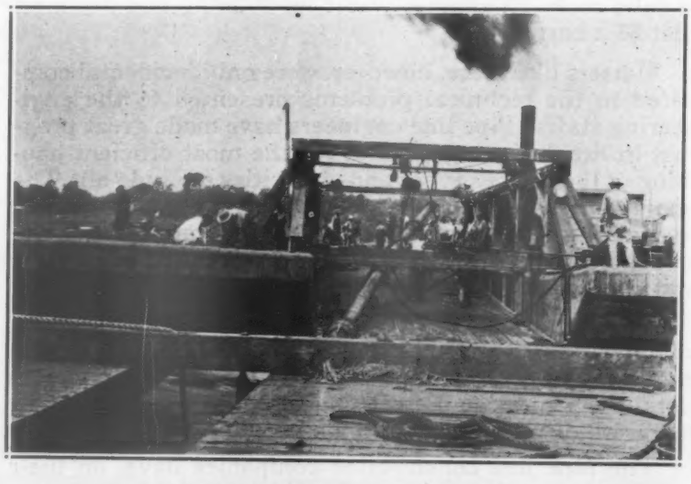
Five compressor stations are being constructed by the Mississippi River Fuel Corp. to bring the gas from the Louisiana Field to the St. Louis market. The first in the chain, the field station, is located near Perryville, La., and is called Perryville station. The remaining stations, with their names and locations, starting at the south end, above the Perryville station, are as follows: Glendale station, near Star City, Ark.; West Point station, Kensett, Ark.; Biggers station, Biggers, Ark.; and Twelve-Mile station, near Fredericktown, Mo. These five stations are approximately 88 miles apart. Each of the five stations is equipped with six 1,000-horsepower, twin-tandem, double acting, gas engine compressing units, with space allowed for future extension.

Water for cooling purposes at the various stations is obtained either entirely from wells drilled on the plant premises or from natural surface sources, such as from Twelve Mile Creek for Twelve Mile station, from the Little Red River for West Point station, and partially from Bayou Boeuf for Perryville station.

Line ready to be lowered into ditch.

The cooling water passes through the compressor jackets by pressure from an overhead tank of 100,000 gallons capacity. Water pumps of the centrifugal type, driven by motors, or automotive type gas engines, discharge water into this overhead tank. The gas coolers are of the atmospheric pipe cooler type.

Electricity for pumping requirements and for lighting the compressor station, as well as for the dwelling houses and plant yard, is generated in an auxiliary room at four of the stations. This equipment consists of three-phase, 220 volt, al-



Preparing to take the line across a river.

ternating current generators, directly driven by four-cylinder gas engines. Electric power will be purchased at the Perryville and West Point stations. For emergencies, gas engine-driven generators have been provided at these two stations.

Each station has a warehouse and machine shop, as well as other necessary buildings and equipment. The machine shop in most cases is a necessity on account of the inaccessibility of well equipped commercial shops. For the benefit of the operators, a locker room, equipped with shower baths and modern sanitary appliances, has been provided at each station.

Six dwelling houses for resident company employes are being erected near each compressing station. These houses are modern in construction, having water and gas systems and electricity. Due to differences in climatic conditions, the details of construction vary somewhat for houses erected in Louisiana from those for the buildings in Missouri. This difference is also reflected in minor details of the compressing stations, as for example in the case of appliances for heating the various buildings.

Sources of Supply

The natural gas to be transported in this line has its origin in the Richland

One section of ditch for line.

Field, southeast of Monroe, La., and in the Monroe Field, generally north and slightly east of north from the city of Monroe. That portion of the gas originating in the Richland Field, after passing a metering station, will flow under its own pressure at present through the 16-inch field line to the Perryville station. It is planned in the future to erect near Alto, La., another compressing station, the necessary site for this station having already been acquired by the Mississippi River Fuel Corp. The natural gas from various portions of the Monroe Field is delivered to a metering station in the near vicinity of the Perryville station, at an approximate pressure of 200 pounds. The Richland Field gas and the Monroe Field gas receive their first compression at the Perryville station, and are started on their journey to the St. Louis district through the 22-inch line. The discharge pressure of this station will be approximately 350 pounds. The suction pressures of the four remaining stations on the line will be about 130 pounds, with a discharge pressure equal to that of the Perryville station. The capacity of the line will be 100,000,000 feet daily.

At the northern terminus of the main line, near the Meramac River, and before the line branches, will be erected the pressure reducing station, called Meramac station. Here the pressure existing in the main line will be cut by regulators to the desired pressure for transmission through the two branch lines. It is planned to deliver natural gas to the industrial consumer at a pressure of from 20 to 25 pounds.

The main line construction contract and the river crossing installations have been let to Ford, Bacon & Davis, Inc., who are using Williams Brothers and the Oklahoma Contracting Co. as subcontractors. The Mississippi River Fuel Corp. itself is constructing the five compressing stations. The foundation work at these stations was done by the Foundation Co. of America. Contracts for laying the two branch lines in the St. Louis district were let to the Frazier-Davis Construction Co. of Missouri, and the Monie Contracting Co., under the general supervision of the Mississippi River Fuel Corp.

Ample Gas Supply Assured

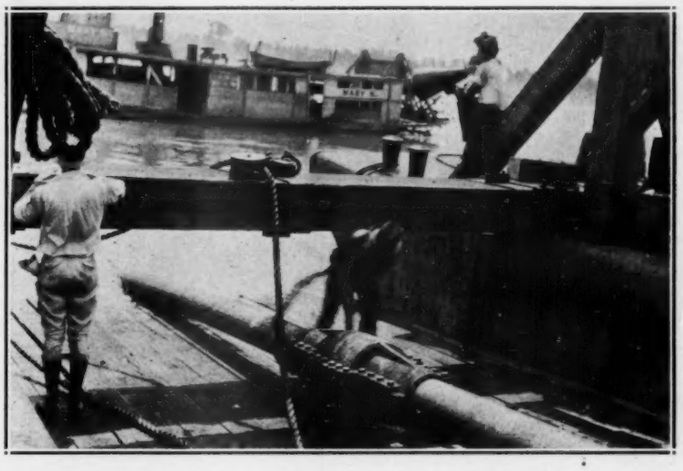
An ample supply of natural gas for the St. Louis pipe line is assured by long term contracts with various producing companies which own the major portion of the natural gas reserves in the Richland and Monroe Fields. These companies are: Interstate Natural Gas Co. and Hope Producing Co., subsidiaries of Standard Oil Co. of New Jersey; Columbian Carbon Co., United Carbon Co., the Palmer Corp. of Louisiana, Industrial Gas Co., subsidiary of Electric Power & Light Co., and Moody-Seagraves Gas Co., Inc., subsidiary of United Gas Co.

Brings Gas to Industries

The Richland and Monroe gas fields in the past have not been accessible to a close industrial market. It is for this reason that such a high percentage of the gas produced from these fields has been burned to carbon black. Even though at a relatively great distance from Louisiana, it is feasible to pipe natural gas to the St. Louis district. This district is a rapidly developing industrial community, having within its area many refractory plants, glass plants, steel foundries, sheet mills, cement plants, and other diversified industries, making it in a position to absorb large quantities of natural gas.

Gas sale contracts have been made with many industrial companies in and around St. Louis. Contracts have also been concluded with the Missouri Industrial Gas Co., affiliated with the Laclede Gas Co., for deliveries of natural gas to industries throughout the city of St. Louis, and with the Cahokia Manufacturers Gas Co., affiliated with the Illinois Power & Light Co., for similar distribution in East St. Louis, Granite City and other communities in the so-called St. Louis district east of the Mississippi River. Arrangements are also under way with the Arkansas Power & Light Co., Arkansas Natural Gas Co., and Missouri Natural Gas Co. for distribution of natural gas in cities and towns along the route of the main line in the states of Arkansas and Missouri.

The main offices of the Mississippi River Fuel Corp. will be in the St. Louis district. At present during the construction period, they are located at 506 North Fourth Street, St. Louis, Mo. A site has been secured and a building is in course of construction in East St. Louis, Ill., to contain the orifice meter department's testing and repair shops, district offices, a warehouse and a garage. The field office of the company during the construction period is located at Little Rock, Ark., in the Rector Building.



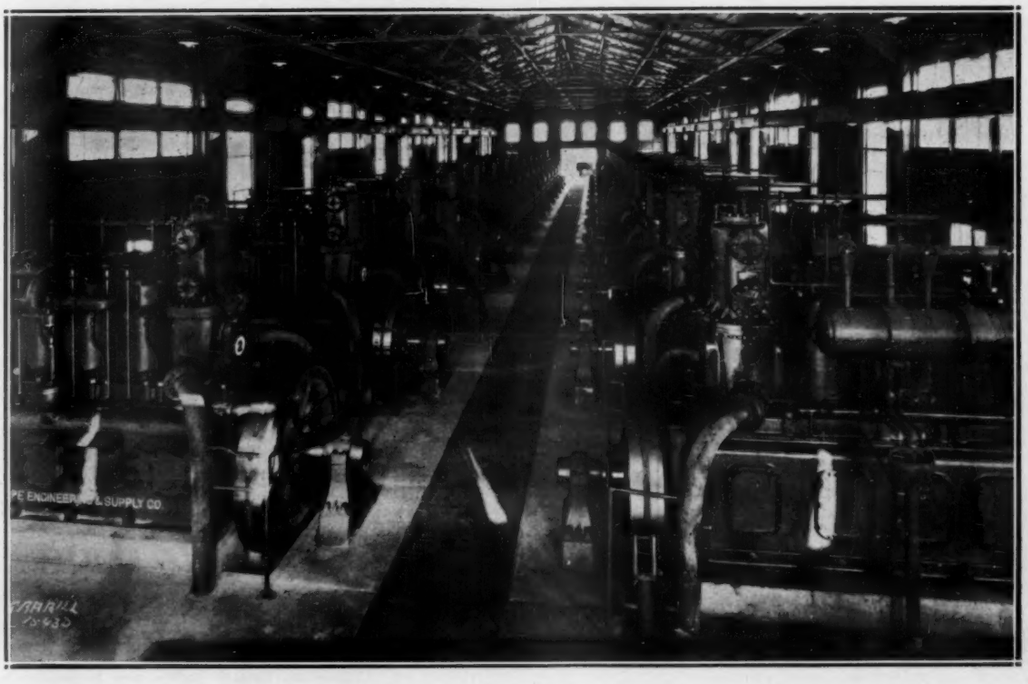
Pipe weighted with river clamp ready to be lowered into water.

Public Officials Co-operated

The realization of this project has only been possible through the active assistance and hearty co-operation of various city and county officials, and of the officers of civic and industrial organizations. Among others should be mentioned: Mayor Victor J. Miller, Walter J. Neun, president of the board of aldermen, and Robert B. Brooks, director of streets and sewers, of the city of St. Louis; Mayor Frank Doyle and the four commissioners of East St. Louis, Ill.; Mayor M. E. Kirkpatrick and the city council of Granite City, Ill.; the county board of supervisors of Madison and St. Clair Counties, Illinois; Roy Jablonsky and Ray Julius, St. Louis county engineers; Harold Bixby, president of the Industrial Club and chairman of the board of the St. Louis Chamber of Commerce; George Smith, secretary of the Industrial Club of St. Louis; Walter Weisenberger, president of the St. Louis Chamber of Commerce; M. H. Ward, executive secretary of the East Side Manufacturers Association; and A. C. Johnston, president of the East St. Louis, Ill., Chamber of Commerce. Many railroad executives, bank officials and business men in and around St. Louis have contributed greatly to the success of this undertaking.

The executive officers of the Mississippi River Fuel Corp. are: President, Christy Payne, 26 Broadway, New York City; vice presidents, Edwin Binney, 41 East Forty-second Street; H. C. Cooper, 545 William Penn Way, Pittsburgh, Pa.; H. C. Abel, 2 Rector Street, New York City; Secretary, Reid L. Carr, 39 Broadway, New York City; treasurer, H. A. Koechling, 26 Broadway, New York City; manager, Ben C. Comfort, 506 North Fourth Street, St. Louis, Mo.

INTERIOR VIEW OF LARGE NATURAL GAS COMPRESSOR STATION



Electrifying Pipe Line Pump Stations

Discussion of the Application of Certain Automatic Features to Electric Driven Pipe Line Pumps

By D. H. Levy
Electrical Engineer, Magnolia Pipe Line Co., Dallas, Tex.

During the past three years there has been much discussion pro and con concerning the advisability of electrifying pipe line pump stations. Several of the major pipe line companies have recently motorized portions of their newer lines and the industry is becoming more and more "electrical minded." There have been many arguments as to the relative merits of the reciprocating pump and the centrifugal pump. These merits do not here concern us, but their adaptability to the problem under discussion will be briefly mentioned. We shall not attempt the development of the economic aspects of the various types of equipment, but shall assume these have been settled. Therefore, our problem shall be a discussion of the application of certain automatic features to the operation of electric driven pipe line pumps.

The motor or engine driven reciprocating pump does not lend itself readily to full automatic control. Its inherent characteristic of pulsating discharge and lack of capacity flexibility precludes its use on full automatic control. However, certain semiautomatic protective features have been adapted to this type of operated station with unqualified success. Among these may be mentioned: (1) Overpressure protection arranged to stop the units when the discharge pressure exceeds a definite set pressure. (2) Lack of suction pressure, alarms and "stops" to disengage or stop the driver of the pumping unit when, if for any reason, the pump is not filling. (3) "Loss of discharge" alarms to indicate to the operators when the pressure fails. This is usually due to line breaks and guards the system against pumping oil into a break in case of line failures.

The centrifugal oil line pump with its almost even nonpulsating delivery, nonoverloading characteristic lends itself readily to full automatic control. Coupled to this we have the simply constructed high speed induction motor, easily started and easily maintained. These two make a unit that is simple in operation, practically trouble free, easily started and controlled and here lies the field for full automatic operation.

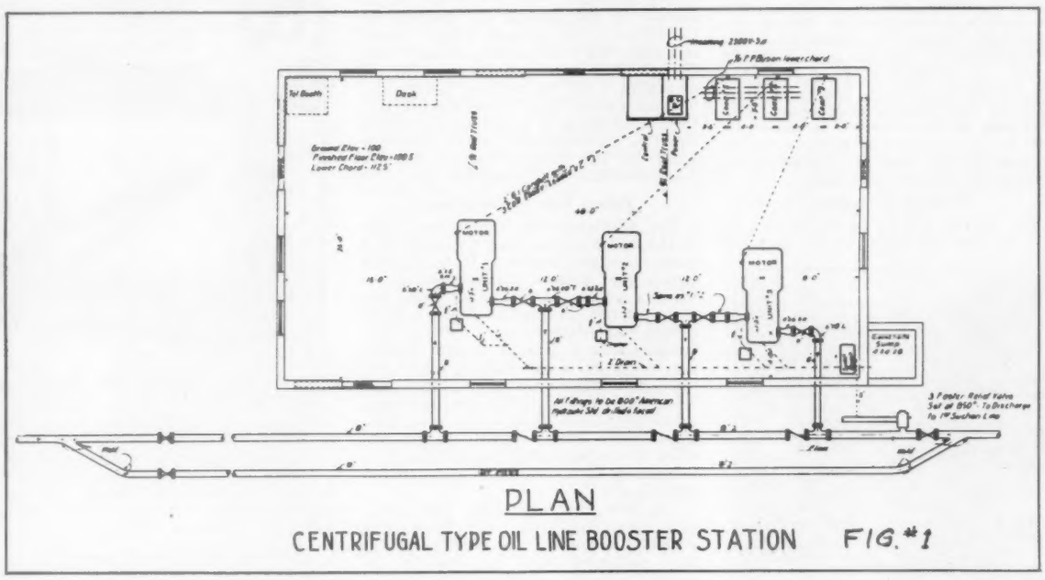
Full Automatic Station

By full automatic oil line pump station is meant a station of one or more electrical driven pumping units equipped with sufficient control apparatus within itself to start, run and stop without the help of any attendants and to conform at all times to a definite predetermined schedule of events. The original control impulse or action causing the station to function may be inaugurated by two or more methods.

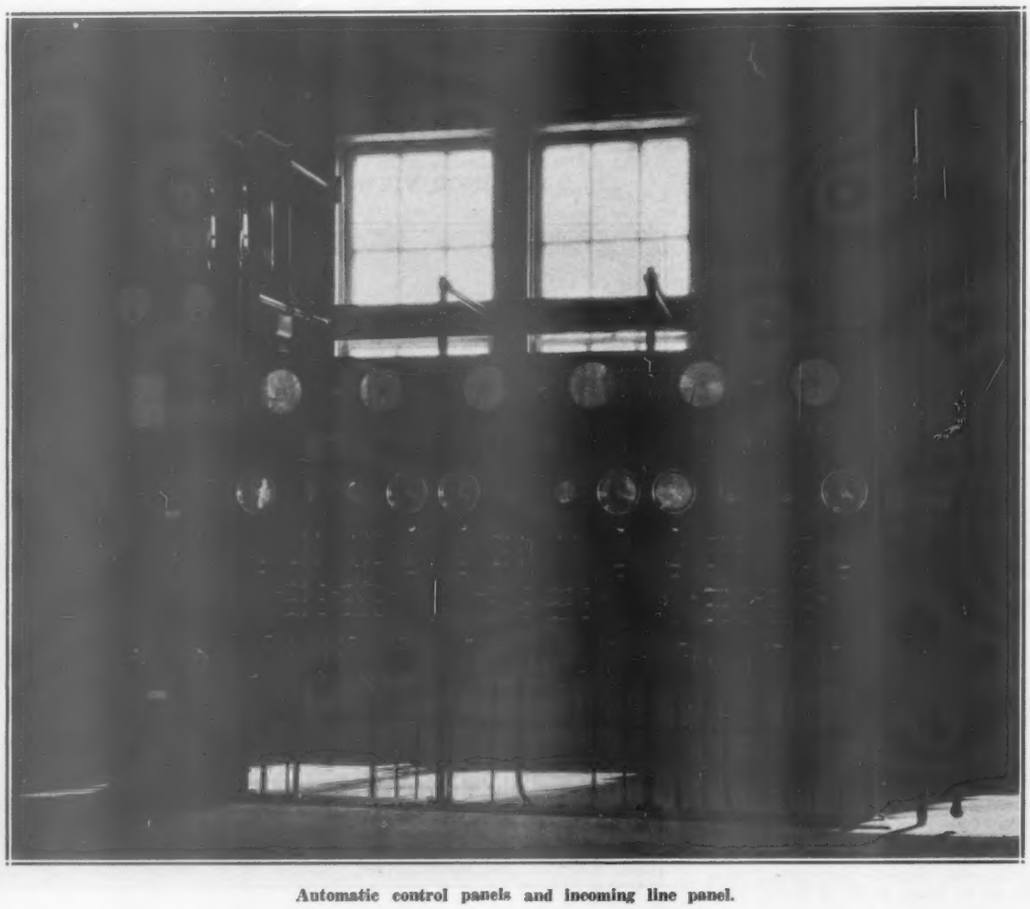
One scheme which is entirely practical from the standpoint of design but which has not been used as yet to any great extent, utilizes electrical impulses sent over a wired system of control from a central point of supervision. This point of control, usually the oil dispatcher's office, can cause the station to function as required. The apparatus consists of a communication system with selective or impulse signalling and correctly tuned receiving apparatus. By sending certain impulses the control point can cause definite operation features to take place. Motors can be started and stopped at will. Sufficient protective relays and apparatus are now available on the market to automatically protect both the equipment and the line from the usual faults. Some of this apparatus will be described more in detail later, as it is common to the developed station described later.

The present objection to this first type of station is the very high first cost, frequent inspection charges and necessary high cost of practical development.

There are now no physical or electrical reasons why such a station could not be installed and operated—in fact such a scheme comprising several booster stations in series and located miles apart could be completely adapted to remote control operation. The station, of course, should



Piping layout of typical three-unit centrifugal pump pipe line station.



Automatic control panels and incoming line panel.

have all the necessary protective features to take them "off the line" in event of unusual conditions.

Another Type of Station

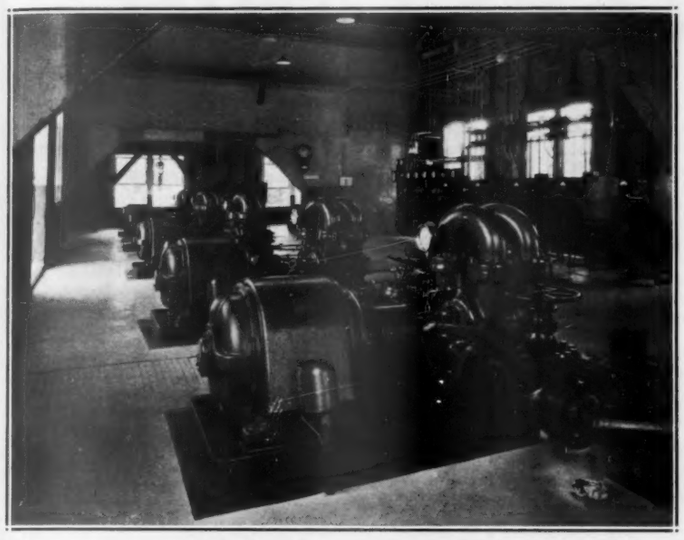
Another type of automatic oil pipe line station recently developed and installed by our company working in collaboration with a pump manufacturer and a motor specialist, depends upon the pressure characteristics within the line itself for the initial actuating medium. This station (we shall call the booster station) consists essentially of three motor driven centrifugal pumps, each designed to deliver the full station discharge at one-half line pressure. These are connected in series as shown in the plan. Figure 1. By reference to this figure, it will be noted units 1-2 or 2-3 or 1-3 can be run together without manually closing a valve. Gate valves are provided to isolate each pump during repairs only. The by-pass line has been installed so that the complete station can be by-passed in event of fire or other emergencies. The valves controlling this line are all manually controlled. All drainage from packing glands and bedplates flows directly to the sump pit, from which it is pumped by a 1¼-inch by 2-inch triplex motor-driven pump into the incoming suction line. The sump pump motor is started by means of a remote controlled magnetic motor starter. The motor is started by means of an enclosed type, explosion proof float switch. Sump level within prescribed limits is maintained at all times.

The electrical apparatus consists essentially of an incoming line panel equipped with an oil circuit breaker, induction type overload relays, undervoltage device and all necessary instruments and instrument transformers for indicating and integrating purposes. A standard bus structure mounted on 1¼-inch pipe frame work is used. See Figure No. 2.

Each motor has its separate automatic magnetic reduced voltage starting compensator, connected to the station bus through a conventional air break, stick operated, disconnecting switch. Either starter may be inspected without shutting down the station.

The station is equipped with all necessary lighting transformers and lighting equipment and has a separate 2,200/220 volt potential transformer supplying current to the control circuits. This latter transformer is fused against short circuit only so as to maintain voltage at all times on the control circuit. All motors and starters are rated 2,200 volts, 3-phase, 60 cycles.

The automatic control panel, Figure No. 3, consists essentially of two dial type electrical pressure switches, adjustable throughout their full scale, two energy transfer relays, two Mercoid pressure switches, one motor driven timing relay (adjustable from instantaneous to 30-minute intervals), two start and stop push button stations, two chart drawing pressure gauges and all necessary selector and control circuit switches, together with the small back-of-board wiring and oil piping.



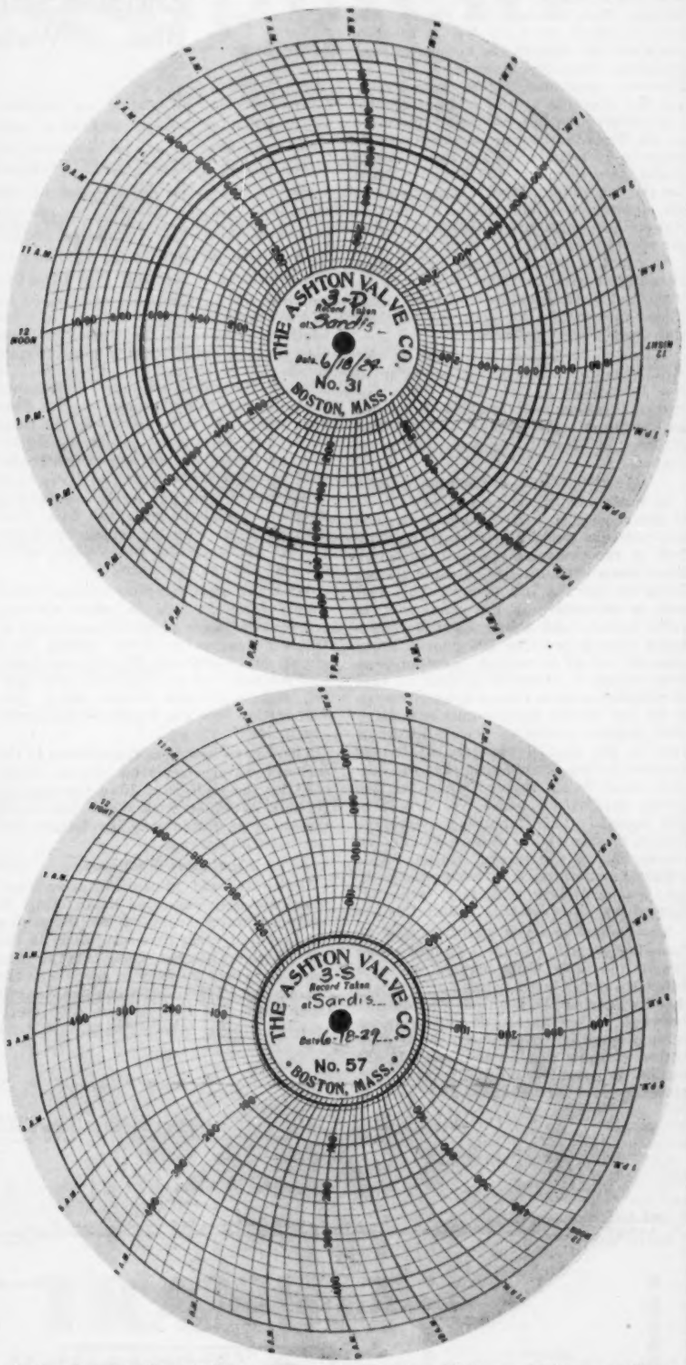
Electrical and mechanical equipment in pipe line station.

General view of automatic pipe line station.

Method of Operation

The station under discussion is located 37.3 miles from the main or controlling station and is 36.8 miles from the next "down stream" station. The line pressure at the main station is normally 700 pounds gauge. The booster station was so located that with two 350-pound pumps in series, a positive suction of 10-pound gauge was had at the No. 1 pump suction, this assuring positive submergence of the first impeller and that no vacuum was drawn by the first pump. This booster station has three sets of pump units working on three separate 8-inch pipe lines, but our discussion will apply to one set only working on one 8-inch line.

To fully describe the operation of this station, let us assume that with full line pressure of 700 pounds at the originating station and with no booster pumps running, 16,500 bbls. of oil per day is being forced through the 74 miles of line. It is now desired to increase the line capacity by starting the booster station. The pressure at the booster is about 360-pound gauge. The operator at Station No. 1 increases his discharge to 725 pounds—this in turn raises the booster station suction pressure to 375 pounds. A contact-making electrical gauge adjusted to make contact at 375 pounds completes the control circuit, energizing the relay that causes No. 1 compensator to function. The first pump starts and the following pressure conditions are reached: The originating station discharge pressure is pulled down but is immediately restored by the operator by closing down on the by-pass valve or placing additional units on the line. The suction at the booster station is pulled down to 130-pound gauge; the discharge is now 480-pound gauge. When these conditions are reached and line conditions become stable, the line is



Automatic pipe line station pressure charts. Top—discharge. Bottom—suction. Note perfect pressure conditions of centrifugal pumps.

delivering at the rate of 20,250 bbls. per day.

It is now desired to boost the delivery to the full line capacity. The operator at the originating station again raises his pressure 25 pounds above normal. This in turn raises the suction of the booster to about 140-pound gauge and another electrical pressure gauge makes contact and partially completes the control circuit of Unit No. 2. This, however, is not completed until this pressure has been maintained for 15 minutes. This delay is caused by a motor-driven timing relay which is inserted in the circuit to keep the unit from "hunting"—due to surges and oscillations in the line. When the definite time interval has elapsed, the control circuit of Unit No. 2 becomes energized and through the automatic compensator, Motor No. 2 comes on the line. Pressure conditions change immediately but the operator at the originating station restores the full 700-pound discharge on his line—the booster suction pressure drops to 10 pounds and the final booster discharge pressure is 700 pounds. These are the conditions of stable operation and are maintained as long as the originating station keeps its discharge pressure at the required amount.

In event of motor trouble each starter is equipped with an I.T.L. no-voltage release and a temperature overload relay. These protect the motor from overload and from loss of voltage.

When it is desired to "drop" a unit at the booster station, the operator at No. 1 opens a by-pass valve. The discharge pressure falls and No. 2 booster unit drops off the line. If it is desired to drop No. 1 unit, the operation is repeated.

Protective Features

In noting additional protective features of the booster station there is a Mercoid over-pressure switch inserted in the main feed to the control circuit. This switch shuts down both units in case the station discharge reaches 750 pounds. This feature is adjustable in any increment to 1,000 pounds and resets itself automatically when a pressure 125 pounds lower than the cut-off is reached. Another pressure switch is installed so that in case of complete suction failure (caused usually by line break) neither unit will start. Still another protective feature incorporated in the control panel is a Mercoid pressure switch so arranged that the control circuit is interrupted when the discharge pressure of pump No. 1 falls to 200 pounds. This feature protects the station in case of line failure on the discharge side of the booster station. This station has performed satisfactorily without bearing relays and they were not deemed necessary on this installation.

The control panel is so wired that by throwing certain selector switches either two of the three units may be operated automatically. It is also so arranged that by varying the position of two knife switches, either automatic operation or manual operation from conventional push button stations can be obtained. If the station is operated manually, the over-pressure—loss of suction—and loss of head protective switches are still in the circuit available for protection of the apparatus and line.

To secure the most satisfactory results from an automatic booster station, it is necessary that the control or originating station deliver a constant, nonpulsating stream of fluid to the pipe line. Surges and other phenomena should be eliminated by means of air bottles. The time delay characteristic of some of the relays has been installed to keep the booster from alternately starting and stopping until the required pressure conditions are obtained. In the design of booster stations of the automatic type, the same consideration must be paid to the choice of pumping equipment and to lay-outs, as in any other kind of station. Pumps selected should fit the capacity of line, pressure conditions and viscosities of fluid to be moved. It is thought that as the use of electricity becomes more general in the pipe line field, more and more study will be given to the development of apparatus suitable to automatic pipe line pump operation.

Gulf Solves Water Scaling Problem

Enclosed System of Cooling Oil Engines Requires but 10 Bbls. of Water With Evaporation Eliminated Entirely

By Andrew M. Rowley

The problem of scaling on cylinder heads and liner jackets, the bane of pipe line companies using oil engines for power and operating in areas of limited water facilities, has been solved by the Gulf Pipe Line Co. through a unique and simple enclosed water circulating system. This system, evolved by E. C. Kincade, vice president of the Gulf Pipe Line Co., and installed in a number of stations by W. F. Rollins, superintendent of the northern division of the Gulf Pipe Line Co., requires only 10 bbls. of water to charge the entire system, and engines in stations in which the new system has been in operation for more than a year have shown no scale whatever. At these stations the total water supply for all station purposes, station houses, etc., consists of one 100-bbl. tank.

Shut-down time due to the necessity of cleaning engines of scale has been eliminated entirely with the consequent better average maintained in the quantity of oil pumped through the station.

With the open reservoir type of water supply formerly used in many stations, evaporation losses of water, especially in West Texas where there usually is a strong wind, averages 75 bbls. per reservoir per day. In an area with little rainfall and inadequate water supply this evaporation loss was a most serious problem in itself.

There is no loss from evaporation in the enclosed water circulating system developed by the Gulf Pipe Line Co. and the 10 bbls. of water with which the entire system of a station may be charged will last indefinitely.

Eliminates Shutdowns

Under the old system formerly used, chemicals were employed in an effort to minimize water scale. Notwithstanding the fact that great care was taken in the use of the different chemicals, it was necessary every 90 days to shut down the engines for 12 hours to wash out the cylinder heads and liner jackets with muriatic acid to clean them of scale. This formation of scale in the engine naturally presented a "hot spot" which eventually necessitated the replacement of parts or repairs to the engine. Notwithstanding the great care taken in the use of the chemicals, the evaporation in the water supply was so great that the water used in the cooling system became so impregnated with chemicals that the chemicals actually settled out and formed a scale.

The Gulf Pipe Line's system is simplicity itself. The water in the enclosed circulating system is cooled by the oil coming into the station. It is simply a reversal of the old principle used in the Panhandle Field of Texas where that paraffin base crude was heated by water. Under the Gulf's plan, crude is used to cool the water. This water in turn is circulated around the engines to cool them.

The diagram below shows the arrangement of the Gulf Pipe Line Co.'s water cooling system. Water from the supply tank is piped to the charging system and when this system is filled, a valve closes the supply from the water tank. The water in the circulating system is then piped to two heat exchangers connected in parallel, the water pipe extending the length of each exchanger four times and then passing into the second heat exchanger which it also traverses four times. Crude oil coming into the station passes through these two heat exchangers and the water is cooled by this oil. The water is then piped to the engines and after passing around the engines is carried to the top of an expansion tank. It is drawn from the bottom of this expansion tank for suction and continues again the movement around through the heat exchangers and engines.

Water Can Be Used Also

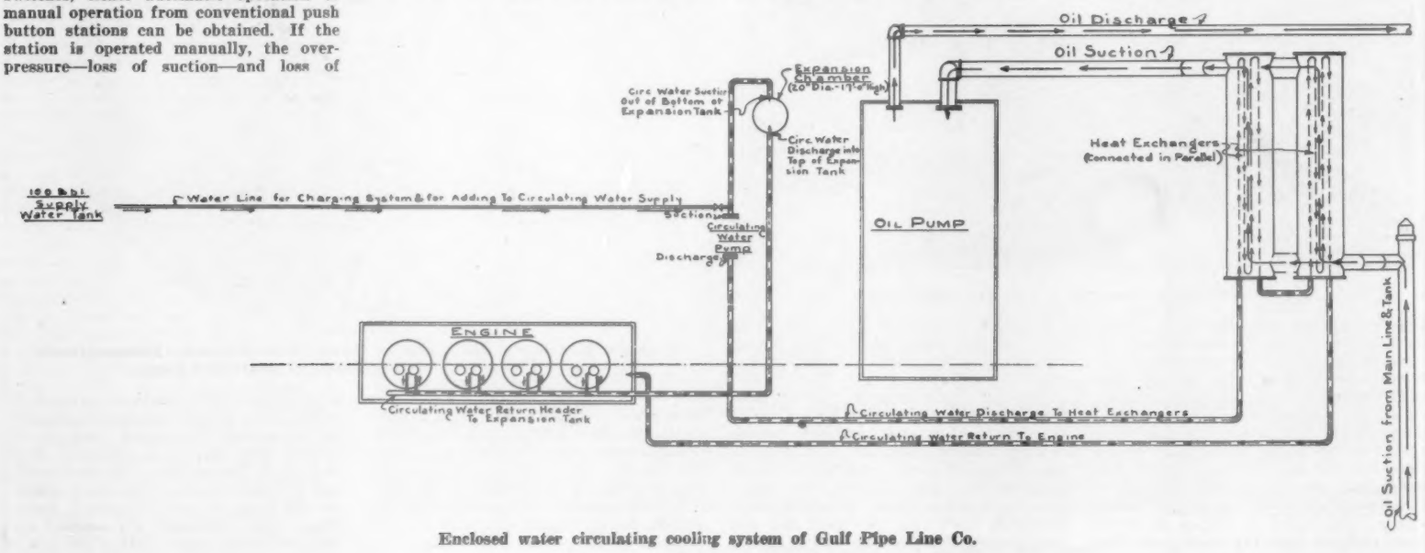
All parts of the system are welded to avoid any leakage. With only 10 bbls. of water for the entire system, it is not necessary to use chemicals or any other method for purifying this water, it being stated not enough deleterious material would be contained in 10 bbls. of water to appreciably affect any part of the engine or other equipment.

The Gulf Pipe Line Co. has this enclosed water cooling system installed in its stations at Grandview, Crane, Midland, Roscoe, Clyde, Coahoma, Ranger and Weatherford.

Where there is an abundant water supply, water can be connected to the heat exchangers to cool the water in the enclosed circulating system instead of connecting the heat exchangers to the incoming oil line. This has been done in several instances. This emphasizes the fact that the primary object of this system is to use a minimum of water, thereby eliminating the possibility of scale, due to deposits from large quantities of water coming in contact with the engine parts or of water strongly impregnated with chemicals depositing these chemicals.

It will be readily seen that this method of cooling engines has two main big advantages. First, it solves the problem of a water supply in sections where water is hard to obtain and, as a result, very costly. Second, it practically eliminates scale due to deposits from large quantities of water or deposits of chemicals where it is necessary to treat large quantities of water.

Lack of water is a most serious and costly problem in many pipe line operations, especially in West Texas. Ordinarily, the location of a pump station on a pipe line depends, to a great extent, on the accessibility of the site to a supply of good water. In an area as extensive as West Texas it is practically impossible to locate stations suitable distances apart and still be guided by this factor of water supply. To give an idea of how hard it is to obtain water in certain sections along the pipe line route—when one company was constructing its line in West Texas it had to haul long distances the water for its construction crews and this company conservatively estimated the water at the camps had cost it $8 a barrel.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Heat Exchangers (Connected in Parallel)
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Suction
Circulating Water Pump
Discharge
OIL PUMP
ENGINE
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Enclosed water circulating cooling system of Gulf Pipe Line Co.

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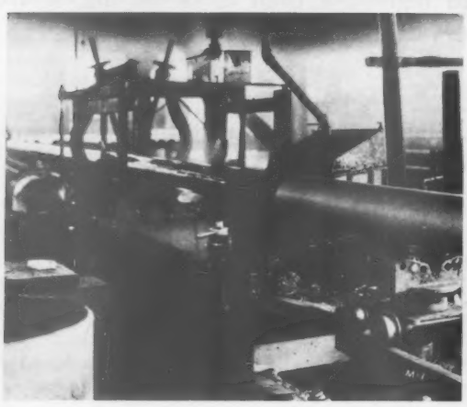

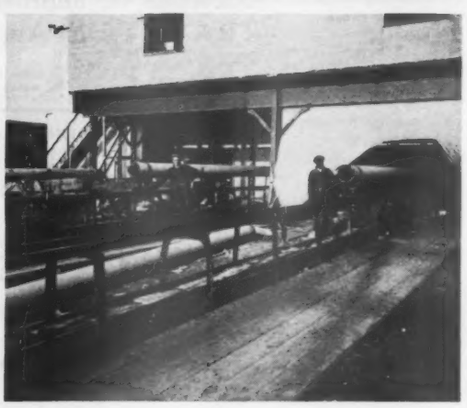

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HOUSTON PORTLAND SEATTLE SPOKANE

Aerial Surveys Aid in Rough Country

Mosaic Maps Save Much Time and Are of Great Value to Engineering Departments of Pipe Line Companies

By E. H. Catlin
Chief Engineer, The Texas Pipe Line Co.

The first aerial photographs were made by the use of cameras attached to kites and later by taking photographs from balloons. Then came the introduction of the airplane and, of course, taking of photographs from them by the use of an ordinary hand camera.

Aerial photography was used to a limited extent before the World War, but its rapid development was due to the experience gained during that war and to the enormous resources expended in developing both the airplane and aerial photographs for military purposes.

Commercial aerial photography profited from the experience in the war until at the present time mosaic maps are used by engineers for a variety of purposes. The United States Government is making extensive use of aerial photography in mapping certain areas.

At first ordinary cameras with telescoping leather bellows were used, but those did not prove very satisfactory. The next step was a new type of aerial camera, hand operated and using a plate or film magazine. This camera was fairly successful, and the hand operation is still used, but a roll film is substituted for the plate or film magazine.

The present development of the aerial camera is one which automatically produces a series of consecutive, overlapping photographs. This removes the human element entirely, as far as taking the photographs is concerned, as the pilot is now able to adjust the proper instrument on his board and then tend strictly to his flying, keeping the proper course and altitude.

Making Aerial Maps

The selection of the proper lens for aerial photography is extremely important. The United States Government has conducted numerous tests of lenses, and these tests indicate that very few makes of lenses are satisfactory. The camera is mounted on the plane with the lens pointing downward through an opening in the fusilage. The elevation at which the plane is to be flown must be determined by means of the focal length of the lens and by the scale of the map desired. The photographic film is covered by exposures 7 inches by 9 inches, the 9 inches being the width of the film. The net effective area of each exposure is only about one-fifth of the picture. This is because only the central part of the photograph is truly vertical. The photographer times the consecutive exposures so that they overlap about 60 per cent, and the pilot plots his flight lines so that the strips overlap about 50 per cent.

The process of making aerial maps is rather a complex one, and is attendant upon several important considerations. The first of these is clear, sunny weather with excellent visibility. Another essential is the very finest aerial equipment, and pilots and cameramen of great skill and long experience. The laboratory workers must also be highly trained men, for upon them depends the character of the finished product.

Examining prints of aerial surveys.

As soon as the films are exposed, they are shipped to the laboratory and put through the necessary processes of developing and printing. Before printing, each exposure is numbered, and the prints are laid on a board in numerical order preparatory to laying the mosaic.

Laying the Mosaic

The process of mosaic laying consists of matching the prints together and gluing them to the board so that the pictures dovetail into one another in an unbroken continuity, thus producing a vertical view of the whole area. Great care and accuracy must be observed in laying the mosaic, for upon it depends largely the character of the finished map. Due to the overlap mentioned before, each portion of the territory appears on two prints, so it is necessary when laying the mosaic to tear off the surplus part of each so that a "feather edge" is left, making it possible to construct the map with smooth and even joints. When the mosaic is completely laid, a negative is made of it, after which it is thoroughly checked for accuracy and quality. Then such incidental work as lettering, etc., is done and the finished map, mounted on either board or linen, is ready for the engineer. The most important feature used in connection with the aerial maps is the stereoscope. This is an instrument which enables the area to be seen in relief. While prominent surface markings, such as hills and valleys, may be discerned from the mosaic map, no actual relief is gained and it remains for the stereoscope to make the hills, valleys, and even houses and vegetation stand out clearly so that a very close approximation as to their comparative height or depth may be obtained. The only equipment necessary to obtain this feature is the stereoscope and copies of the contact prints of the area. As each part of the territory is shown on two prints, due to the overlap at different vertical angles, the focusing of these un-

Section of aerial survey of The Texas Company's line from Iraan to Houston.

Count the Lincoln "Stable-Arc" Welders *on Pipe Line Jobs*

More than 300 Lincoln "Stable-Arc" welders are being used to arc-weld thousands of miles of pipe line. The Lincoln roll call includes the following pipe lines:

Monahans—Port Arthur, Texas	714 miles	110 "Stable-Arc" welders
Cushing, Okla.—Chicago, Ill.	632 miles	91 "Stable-Arc" welders
Roma, Texas—Monterrey, Mexico	125 miles	48 "Stable-Arc" welders
Tres Pinos—Mendota, Calif.	49 miles	16 "Stable-Arc" welders
Rock Springs, Wyo.—Ogden—Salt Lake City, Utah	277 miles	10 "Stable-Arc" welders
San Augustine—Corsicana, Texas	157 miles	10 "Stable-Arc" welders
Monahans, Texas—Jal, N. M.	40 miles	10 "Stable-Arc" welders
Port Arthur—Port Neches, Texas—2 lines each	11 miles	6 "Stable-Arc" welders
El Paso, Texas—Jal, N. M.	205 miles	6 "Stable-Arc" welders
Lamkin—Hodge, La.	45 miles	5 "Stable-Arc" welders
Lafors—Childress, Texas	80 miles	5 "Stable-Arc" welders
San Antonio—San Marcos, Texas	50 miles	5 "Stable-Arc" welders
Monahans—Midland, Texas	60 miles	3 "Stable-Arc" welders
City of San Antonio, Texas	20 miles	2 "Stable-Arc" welders
Hodge—Jonesboro, La.	9 miles	2 "Stable-Arc" welders
Freeport—Mount Bryan, Texas	6 miles	2 "Stable-Arc" welders

The roll call definitely proves the marked preference of general contractors and welding contractors for "Stable-Arc" welders. Their preference has placed Lincoln arc-welding equipment far in the majority on arc-welded pipe line jobs.

The Lincoln Electric Co.
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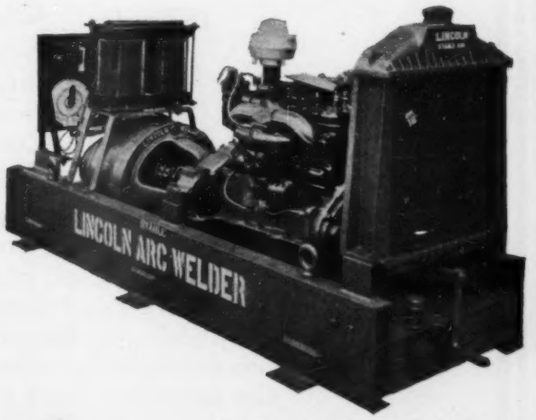

This is a type of Lincoln "Stable-Arc" Welder popular on arc-welded pipe line jobs. It is a 200-ampere generator powered by a heavy duty 1200 r.p.m. engine.

W-102

"Stable-Arc" LINCOLN WELDER

1000 miles

of pipe line

Electric

Arc-Welded

SINCE September 1, 1928, we have electric welded more than 1000 miles of pipe lines, including the following:

157 miles	8-inch	San Augustine-Corsicana, Tex.
80 miles	8-inch	Lafors-Childress, Tex.
40 miles	10-inch	Monahans, Tex.-Jal, N. M.
50 miles	6-inch	San Antonio-San Marcos, Tex.
424 miles	12-inch	Cushing, Okla.-Chicago, Ill.
250 miles	12-inch	At mill, Indiana Harbor, Ind.

This unequaled record of successful arc welding operations in pipe line construction, coupled with an organization composed of a staff of experienced welding engineers, crews of competent pipe line welding operators, supplied with the most modern arc welding equipment, has established universal recognition of our company as the foremost electric welding contractors in the field.

Our experience, gained in the electric welding of more than a thousand miles of pipe lines, is placed at your disposal. We shall be glad to work with you on your next pipe line project.

THE WELDING ENGINEERING CO.

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der different angular mirrors of the stereoscope throws the area in sharp relief. Thus it is possible for an engineer to sit in his office, study the maps and plot the most advantageous location through the territory, as he has a complete picture of the entire area to scale and relief.

The reading, or interpretation, of aerial maps is not easy at first. It is of primary importance that the picture be held in the proper position. The observer must imagine himself looking directly down on the scene and he must place the mosaic map in the position in which experience has shown that the image appears most natural, otherwise, a depression will appear as an elevation and an elevation as a hollow.

A skillful manipulation of both aeroplane and camera is necessary to the success of the mosaic map. To prevent distortion and variation of scale, the camera must be maintained at the same altitude at all times and pointed directly vertical. Still greater skill is necessary when consecutive rows of exposures are made for the purpose of placing strips of photographs side by side to cover a large area. The modern planes and cameras are equipped with many ingenious devices to enable the pilot to fly at a uniform altitude and with an even keel.

An aerial film is about 75 feet long and allows 100 exposures, each 9 by 7 inches. On one film, an area of 50 square miles may be accurately mapped from an elevation of 10,000 feet, which is the usual height at which the photographs are taken to make a mosaic map on the scale of 1 inch equals 1,000 feet.

The Texas Company's Survey

Last June I received orders to make a survey for the location of a pipe line from Houston, Harris County, Texas, to Monohans, Ward County, Texas. It was necessary that this survey be completed at the earliest possible date, in order that right of way could be secured before the arrival of the pipe. The actual survey was started June 20, 1928, and completed August 15, 1928—a distance of 572.89 miles.

From Houston to San Marcos, the location of this line was comparatively easy. At San Marcos we cross the Balcones Fault, and from this point to Iraan (Yates Pool) the country is all rough, badly cut by canyons, and, in addition to this very few good maps were available. The question of using aerial maps on the section from San Marcos to Iraan was discussed but, as I had never used these maps, I was doubtful of the value of them, in fact, I was from the extreme northwest corner of "Missouri" when it came to the use of aerial maps. An order was placed for the maps of a small section and these proved to be of so much value that an order was placed for aerial maps of the proposed line from San Marcos to Iraan. The surveying parties were already at work when this order was placed, so we arranged to have the maps made and delivered to us in sections of about 20 miles each. On account of weather conditions, it was often a pretty close race to get the new map to the surveying party in time, but, due to the hearty co-operation of the map makers, no delays of this kind were encountered.

The sections of the mosaic map were made up on a scale of 1 inch equals 1,000 feet, and covered an area approximately 4 miles wide and from 20 to 30 miles long. These mosaic maps were mounted on muslin so that they could be used in the field. As soon as a section (20 to 30 miles) of the mosaic map was completed, we would go to the laboratory and lay out our location on this map. In order to locate the route desired, it is necessary to first study the map carefully in order to determine the location of canyons, high hills, towns etc. Having located the line approximately, the next step is to stretch a string over the approximate location, holding it in place at all turns by means of thumb tacks. Next, start at one end of the map and study the map carefully along the location indicated by the string and make the necessary changes by inserting more thumb tacks. On some sections of the map, three or four separate lines would be located by strings, then, in order to determine the best one, it is necessary to have the prints along these lines so that they can be examined with a stereoscope; it is very easy to determine the best line by examining the prints along the various lines with a stereoscope. After the location is finally decided upon, mark it on the print with ink or red pencil and turn the print over to the survey party in the field. By the use of these maps, the location of the line is practically settled, and the field party has only to stake the line, look out for minor obstructions, get ownerships and "tie-ins," so that tracings and right of way lists can be prepared.

Mosaic Mounted on Rollers

After the whole line is photographed a mosaic map is made in one piece and mounted on rollers, so arranged that they may be attached to a drafting table. One roller is on each end of the table, and any portion of the mosaic map may be moved over the table and examined; on this map, ink in the line as finally located, show county lines and the names of all cities, towns, railroads, rivers, etc.

The mosaic maps are a great help in making tracings, as the accurate location of roads, rivers, fences, etc., is shown on them. When the location of the station sites are determined by the hydraulic grade line, it is possible to locate these points exactly on the mosaic map and, by examining the stereopticon views determine if the site is practical, thus avoiding trips to the field to examine these sites.

Aerial maps were made covering a section of the line from San Marcos to Iraan. This is a distance of 260 lineal miles, and covers a strip 4 miles wide for most of the distance, while some of the rougher sections of the country are covered with a strip 8 miles wide; in all, a total of 1,447 square miles was photographed and mosaic maps made on a scale of 1 inch equals 1,000 feet. In addition to the mosaic map, stereopticon prints were furnished for the entire 260 miles.

The cost of these mosaic maps ranges from $22 to $30 per square mile, depending upon the scale used, the location of the country to be mapped, the hazards of flying, and the location of landing fields in relation to the country to be mapped.

A great saving in cost and area of the aerial maps can be made if there is sufficient time to fly over the proposed route, marking upon the best obtainable maps, control points and then putting markers on the ground at these points before photographs are made.

The mosaic maps are a great help in mapping oil fields, domes, etc., and for use in lawsuits concerning boundary lines.

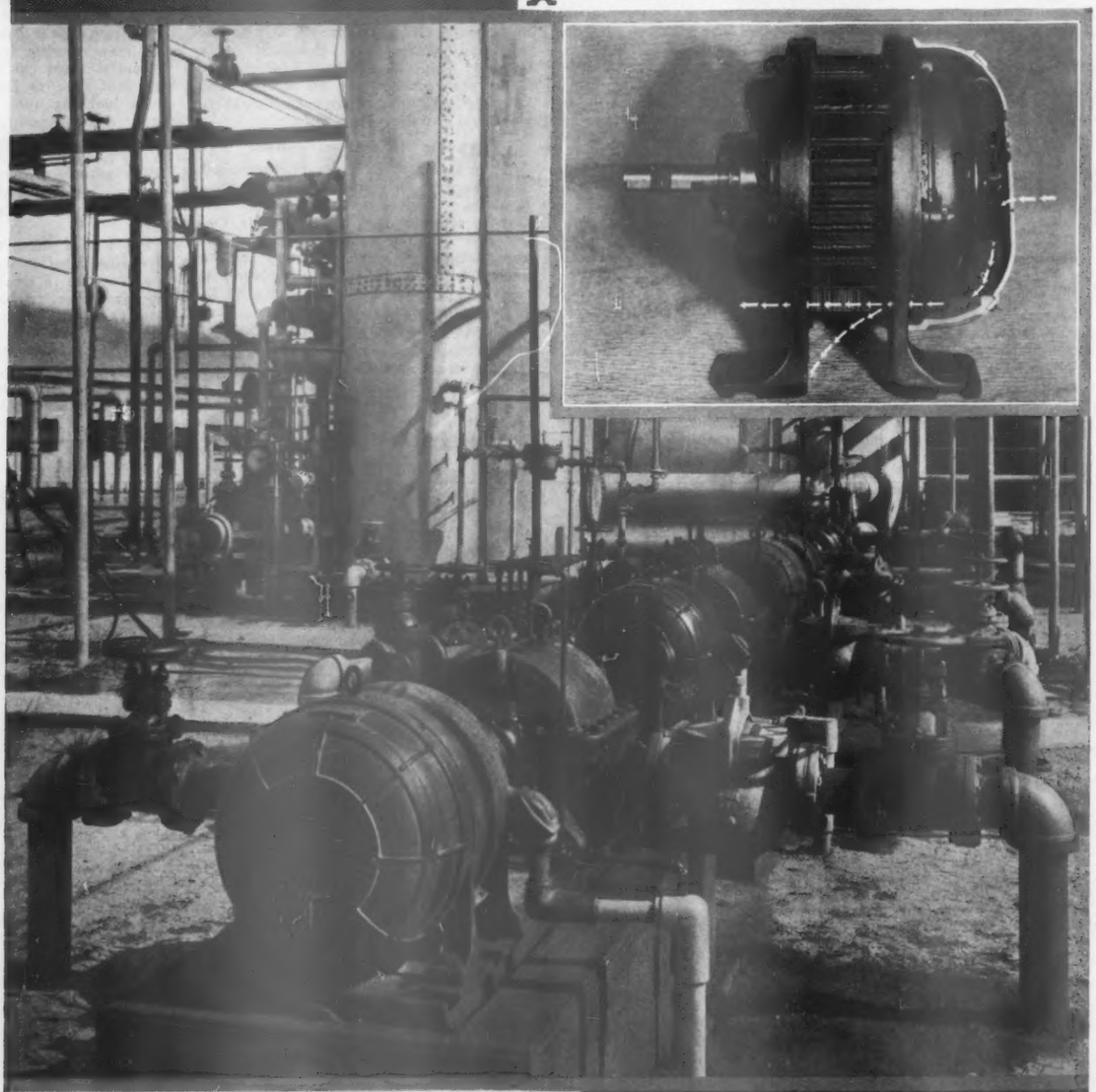
The use of these mosaic maps in our pipe line location saved us at least a month's time in locating the line and, at the same time, enabled us to get a location that was easy to construct and maintain.

As stated above, at first I was doubtful of the value of aerial maps for engineering use, but now am frank to say that I am thoroughly "sold" on the use of them for pipe line location through any rough country.

View of topography of land as shown by aerial survey of The Texas Company's line from Iraan to Houston.

Weather-proof Motors

Wagner air-jacketed Motors are dust-proof and weather-proof yet thoroughly ventilated. They are totally enclosed and completely sealed against dust, gases, fumes, steam and moisture. An externally-mounted blower jackets the motor with continuously moving air and keeps it cool. These motors are operating outdoors and indoors, in the field, in refineries, on pipe lines, in gasoline plants.



Wagner builds every commercial type of motor and can recommend without prejudice the proper motor for the job.

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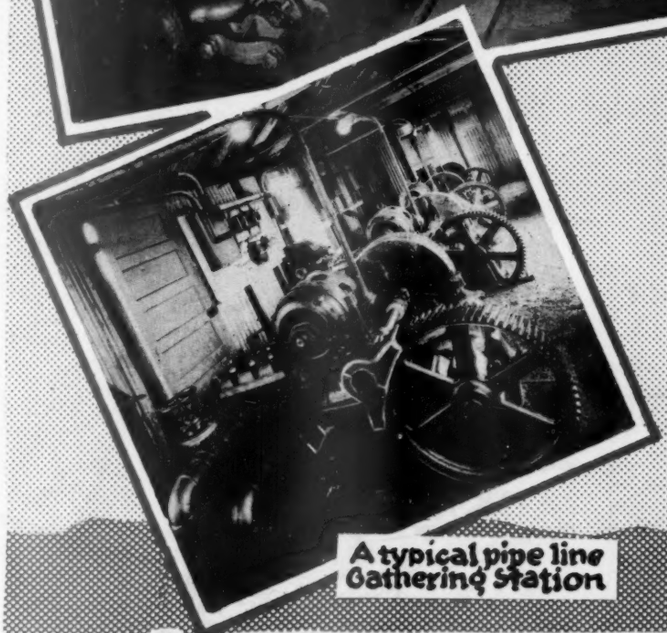
31 Pumping Stations of Pipe Line Companies in Our Territory Are Operated by electric power

A typical pipe line Pumping Station



A typical pipe line Gathering Station

ELECTRIC PUMPING EQUIPMENT enables operators to buy their power at a FIXED charge.

For example: Varying market prices for fuel oil or gas makes that kind of power very uncertain in cost from year to year. The price may be favorable when equipment is purchased and installed—but the next year's contract rates may be entirely out of line.

Executives who route their pipelines conveniently near the more than 2,000 miles of transmission lines which this company maintains throughout 45 West Texas Counties—and install ELECTRIC pumping equipment—are not only SURE of a steady, dependable supply of power under all conditions, but are SAFELY PROTECTED from any increase in power costs.

The rates for ELECTRICITY are constantly becoming cheaper—regardless of market prices of other fuel commodities.

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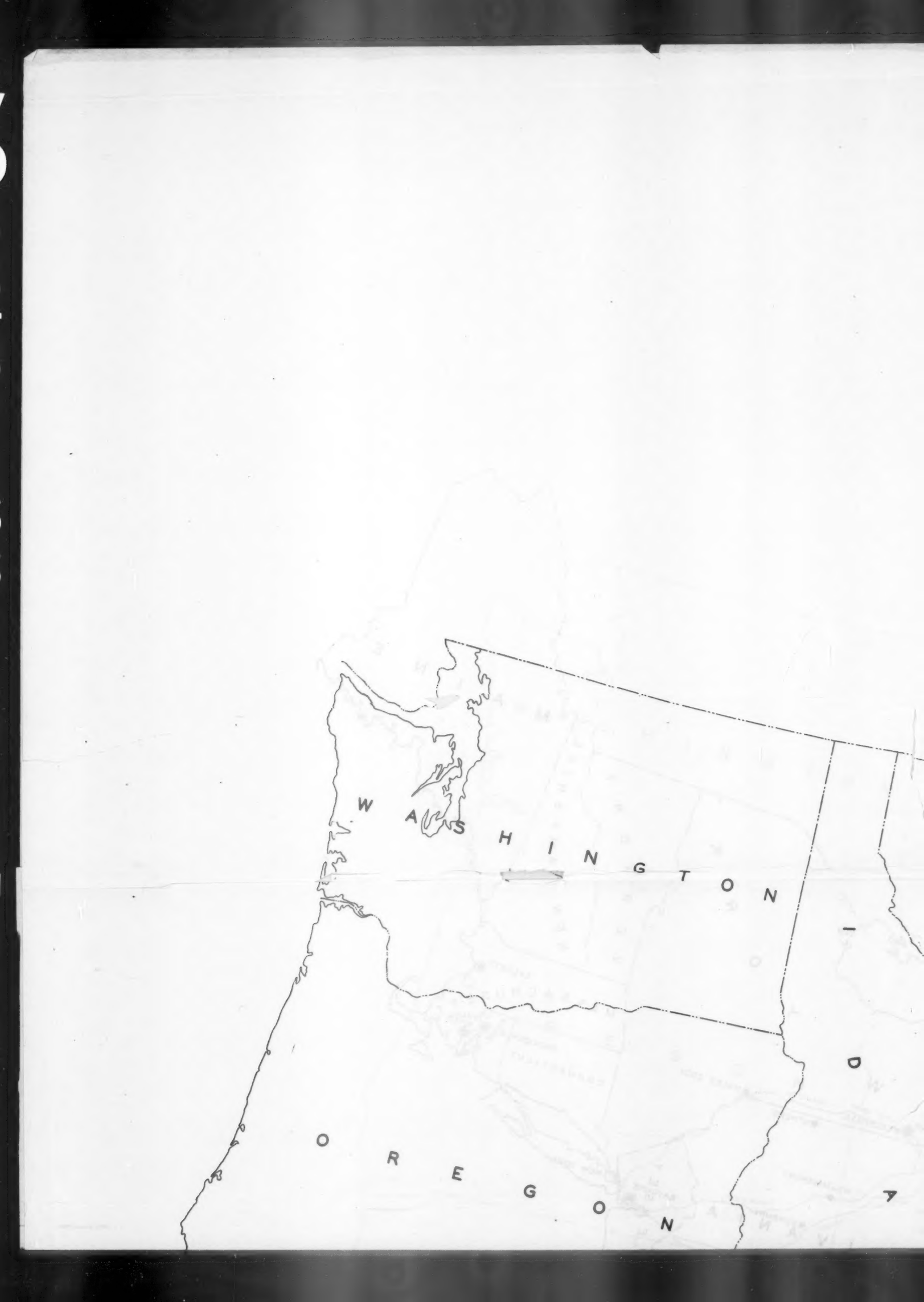
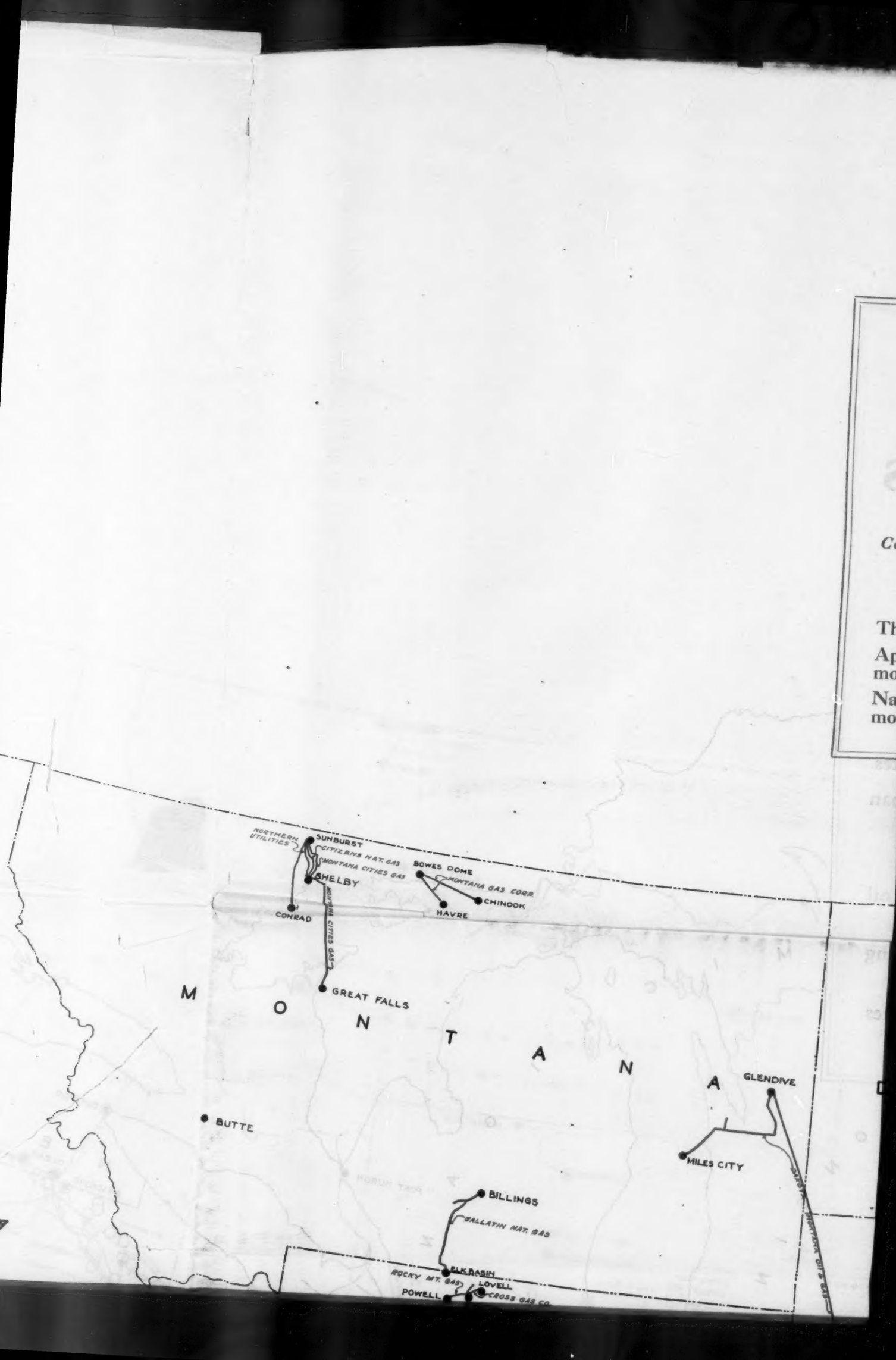
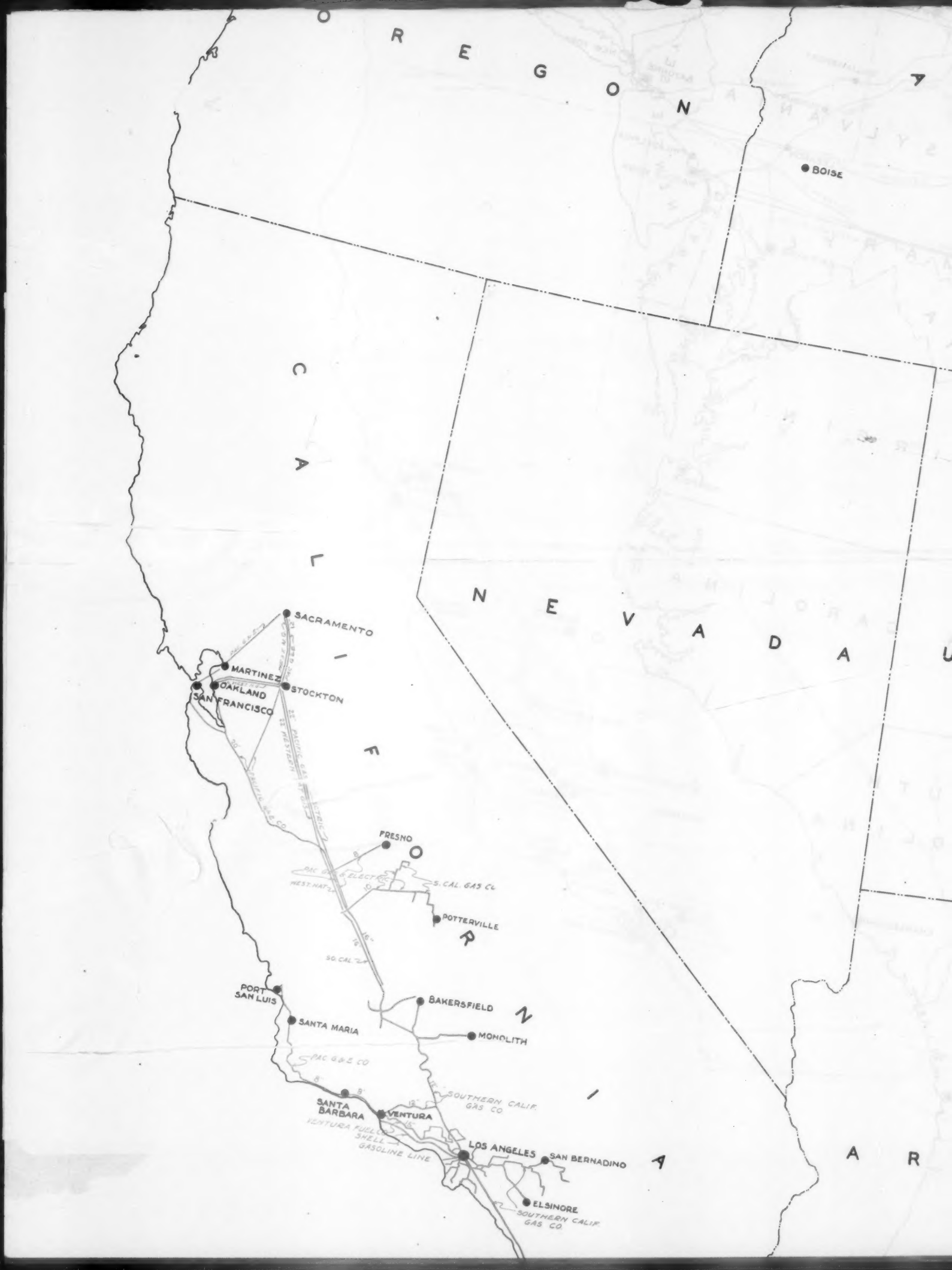
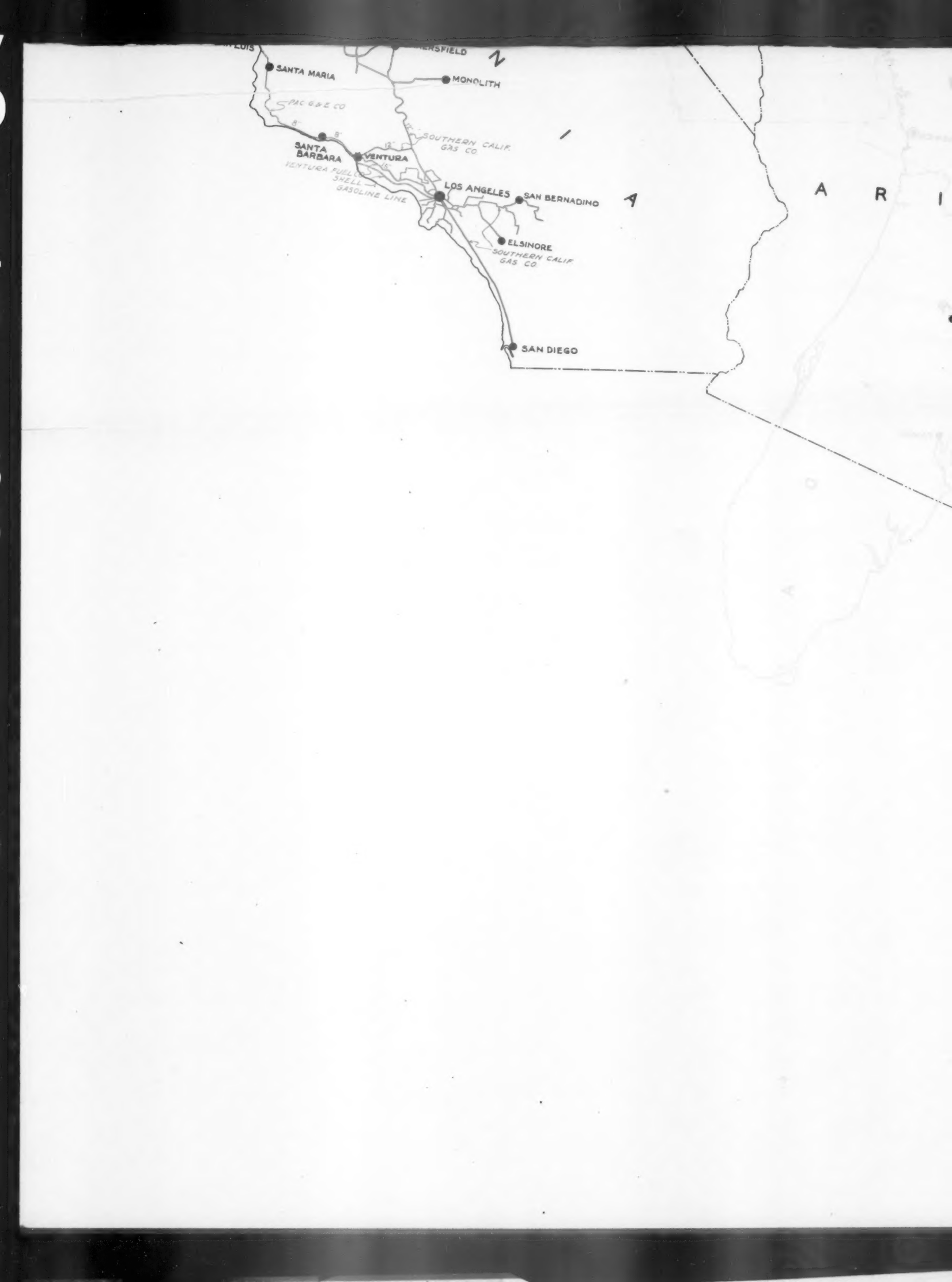
In the Land of Opportunity
General Offices Abilene, Texas


WASHINGTON
OREGON


NORTHERN UTILITIES
SUNBURST
CITIZENS NAT. GAS
MONTANA CITIES GAS
SHELBY
CONRAD
BOWES DOME
MONTANA GAS CORP.
CHINOOK
HAVRE
MONTANA CITIES GAS
GREAT FALLS
M O N T A N A
BUTTE
GLENDIVE
MILES CITY
BILLINGS
GALLATIN NAT. GAS
ELK BASIN
ROCKY MT. GAS
LOVELL
POWELL
CROSS GAS CO.


OREGON
BOISE
CALIFORNIA
NEVADA
SACRAMENTO
MARTINEZ
OAKLAND
SAN FRANCISCO
STOCKTON
FRESNO
S. CAL. GAS CO.
POTTERVILLE
PORT SAN LUIS
SANTA MARIA
BAKERSFIELD
MONOLITH
PAC. G. & E. CO.
SOUTHERN CALIF. GAS CO.
SANTA BARBARA
VENTURA
VENTURA FUEL CO.
SHELL GASOLINE LINE
LOS ANGELES
SAN BERNADINO
ELSINORE
SOUTHERN CALIF. GAS CO.

BILLINGS
MONTANA
YELLOWSTONE NAT. GAS
ELK BASIN
ROCKY MT. GAS
LOVELL
POWELL
CROSS GAS CO.
BYRON
ROCKY MT. GAS
CODY
GREYBULL
OREGON BASIN
BASIN
LITTLE BUFFALO BASIN
BIG HORN GAS
LITTLE GRASS CREEK
THERMOPOLIS GAS CO.
THERMOPOLIS
WYOMING
SAND DRAW
RIVERTON
NEW YORK
NEW YORK OIL CO.
LANDER
CASPER
GLENROCK
MAHONEY DOME
ROCKY MT. GAS
RAWLINS
PARCO
ROCK SRINGS
NEW YORK OIL CO.
BAXTER BASIN
MOUNTAIN FUEL SUPPLY CO.
NT. FUEL SUP. CO.
SALT LAKE CITY
HIAWATHA DOME
CHEYENNE
EMPIRE
FT. COLLINS
BOULDER
DENVER
COLORADO
COLORADO SPRINGS
PUEBLO
COLORADO INTERSTATE GAS CO.
UTAH
COLORA
ALBUQUERQUE
RIZONA
NEW MEXIC


SANTA MARIA
MONOLITH
PAC G & E CO
8"
8"
SANTA BARBARA
12"
SOUTHERN CALIF. GAS CO.
VENTURA
16"
VENTURA FUEL
SHELL
GASOLINE LINE
LOS ANGELES
SAN BERNADINO
ELSINORE
SOUTHERN CALIF. GAS CO.
SAN DIEGO
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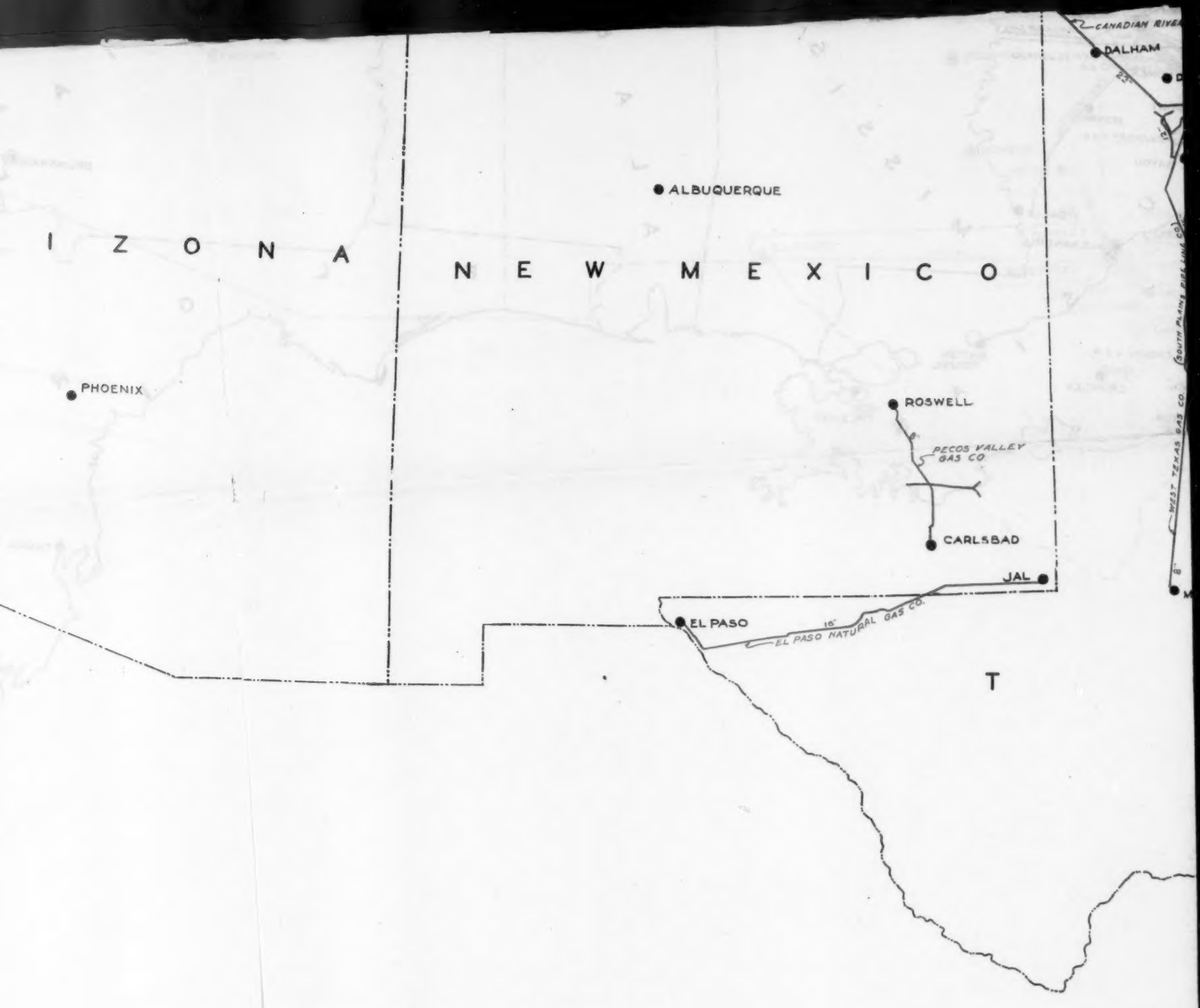
CANADIAN RIVER
DALHAM
ALBUQUERQUE
I Z O N A
N E W M E X I C O
PHOENIX
ROSWELL
PECOS VALLEY GAS CO.
CARLSBAD
JAL
EL PASO
EL PASO NATURAL GAS CO.
T

The Oil and Gas Journal's Map
of
Natural Gas Trunk Pipe Lines in the United States

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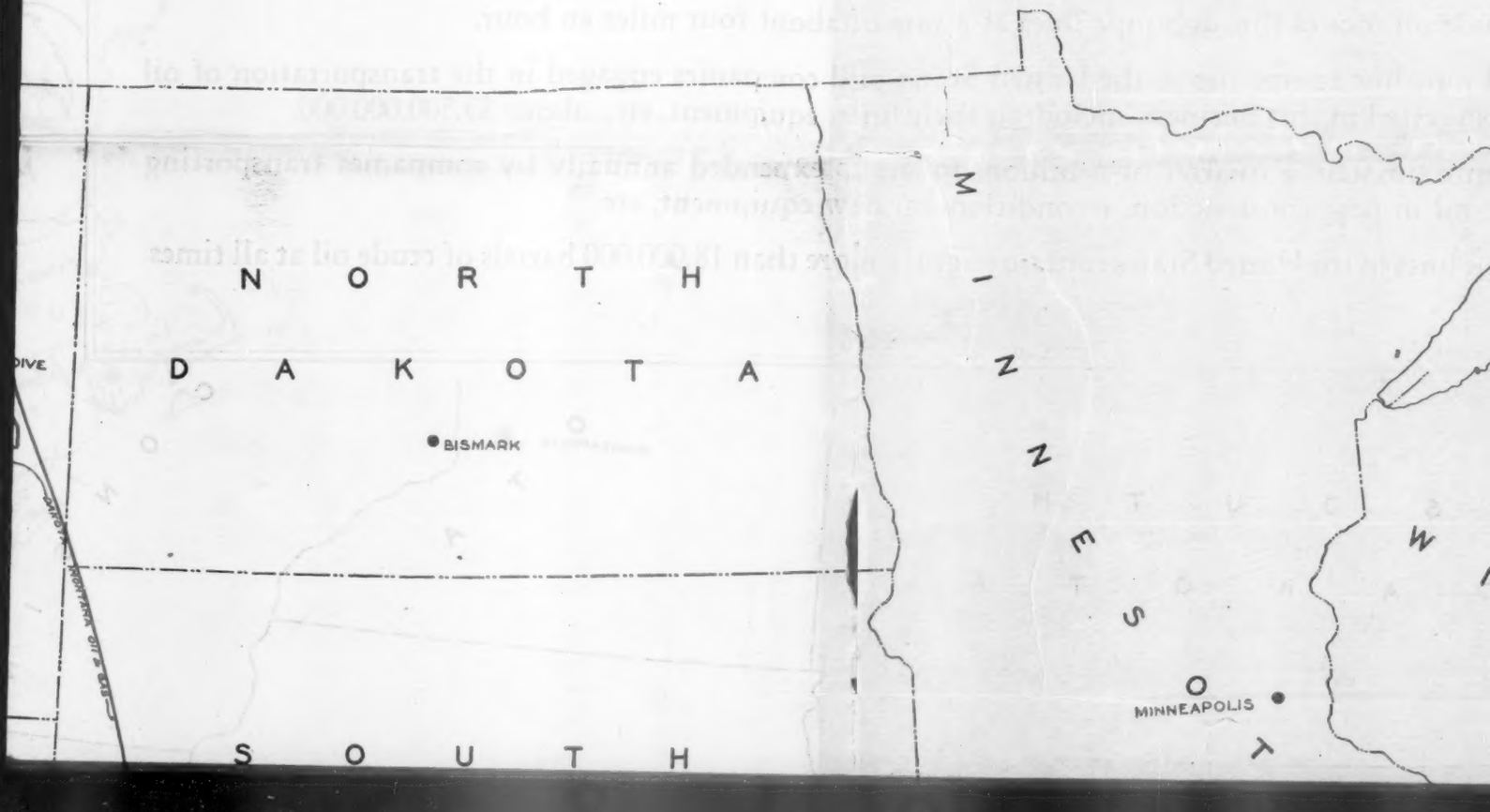
An Immense Industry

There are approximately 57,000 miles of natural gas pipe lines in the United States.

Approximately $1,750,000,000 is invested in the natural gas industry. Sales of natural gas last year to more than 1,600,000,000,000 cubic feet.

Natural gasoline produced last year totaled more than 1,775,000,000 gallons, or nearly 11 per cent of the na motor fuel.



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reproduction in

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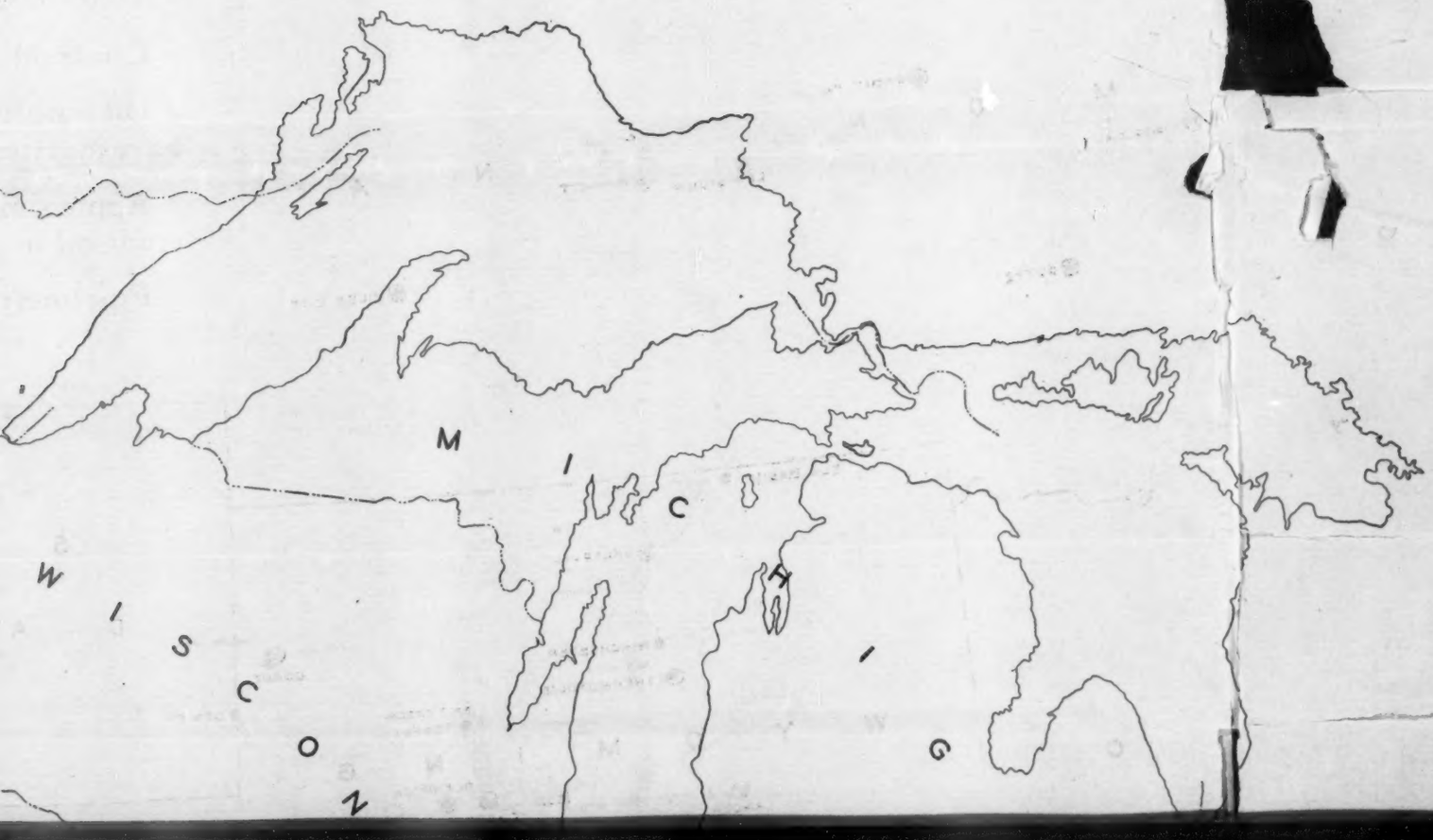
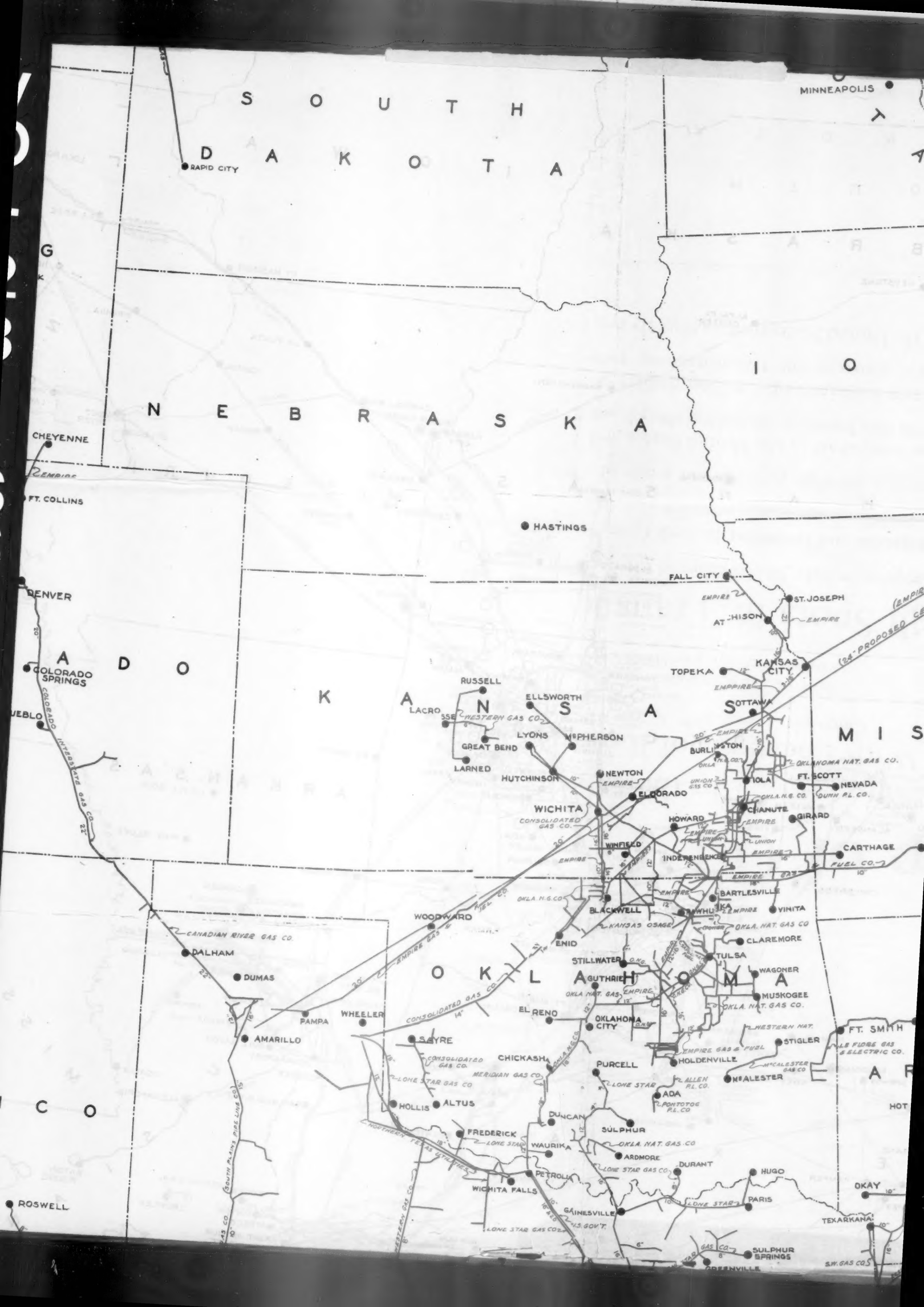
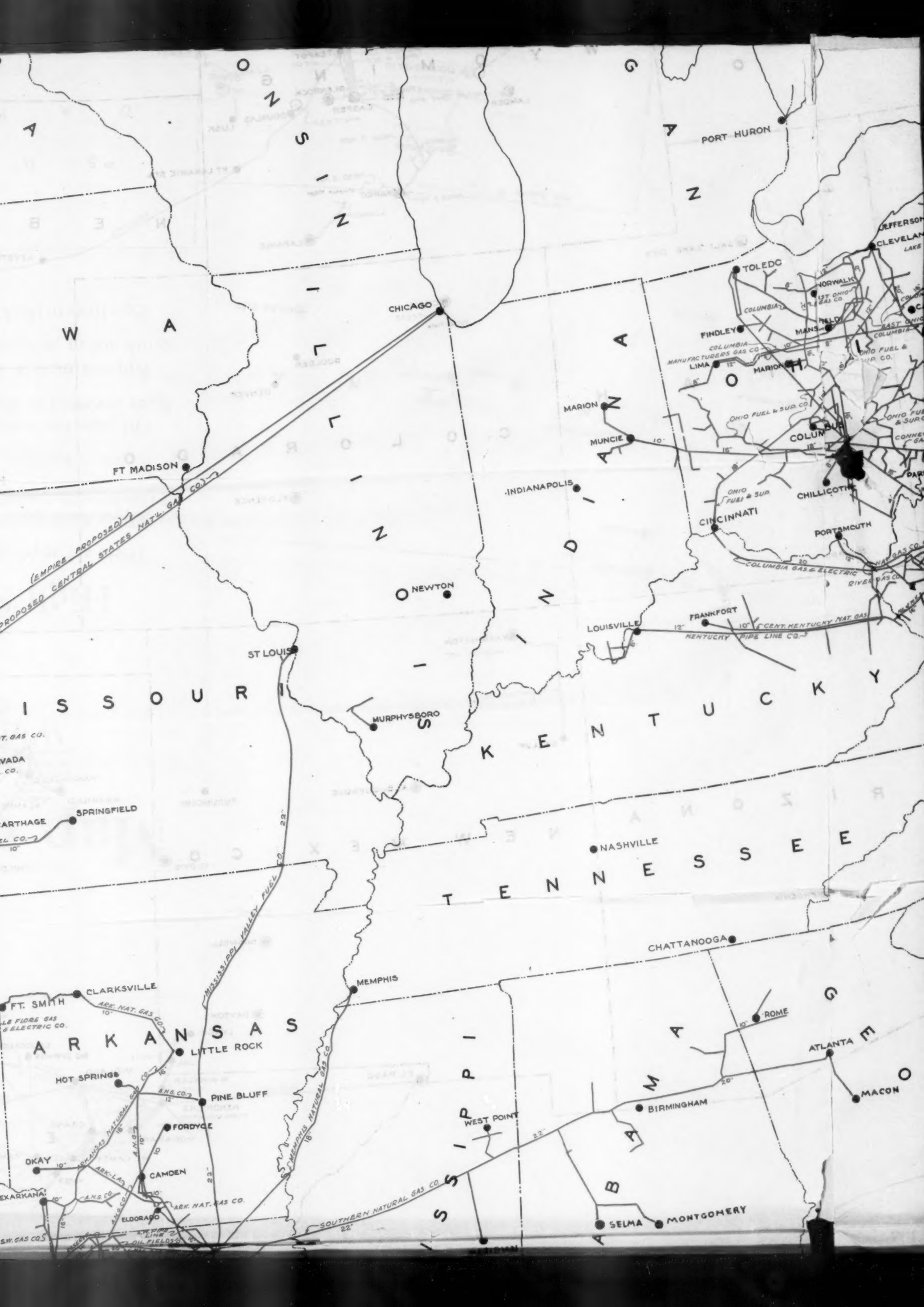
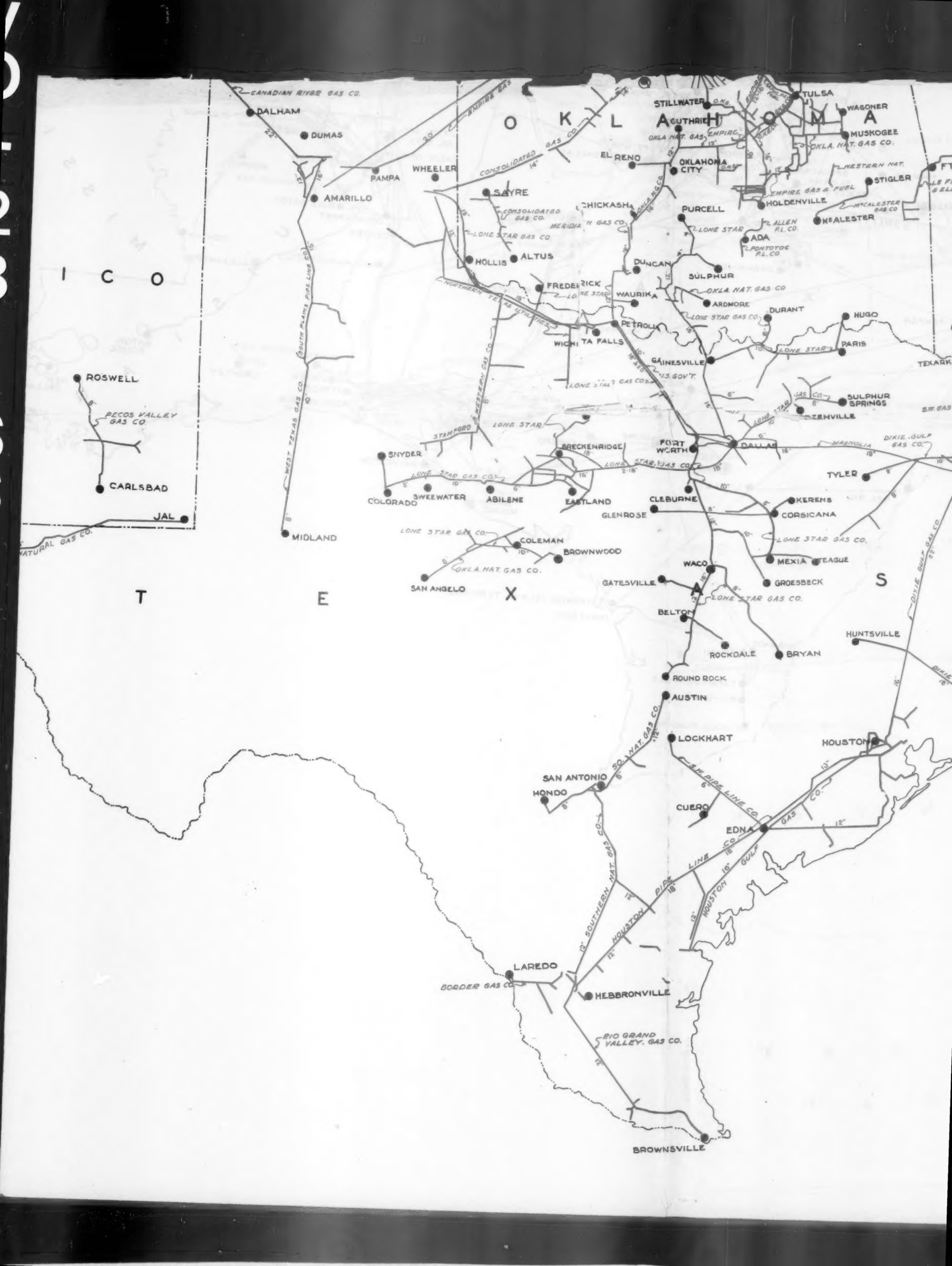



SOUTH DAKOTA
RAPID CITY
MINNEAPOLIS
NEBRASKA
CHEYENNE
FT. COLLINS
HASTINGS
DENVER
COLORADO SPRINGS
PUEBLO
COLORADO INTERSTATE GAS CO.
FALL CITY
ST. JOSEPH
ATCHISON
TOPEKA
KANSAS CITY
OTTAWA
RUSSELL
LACROSSE
ELLSWORTH
WESTERN GAS CO.
LYONS
McPHERSON
GREAT BEND
LARNED
HUTCHINSON
NEWTON
EMPIRE
EL DORADO
WICHITA
CONSOLIDATED GAS CO.
BURLINGTON
OKLA. N.G. CO.
OKLAHOMA NAT. GAS CO.
IOLA
FT. SCOTT
NEVADA
UNION GAS CO.
DUNN PL. CO.
CHANUTE
GIRARD
HOWARD
WINFIELD
INDEPENDENCE
CARTHAGE
FUEL CO.
BARTLESVILLE
BLACKWELL
TONKAWA
VINITA
KANSAS OSAGE
OKLA. NAT. GAS CO.
WOODWARD
CANADIAN RIVER GAS CO.
DALHAM
ENID
CLAREMORE
STILLWATER
TULSA
GUTHRIE
WAGONER
MUSKOGEE
DUMAS
PAMPA
WHEELER
EL RENO
OKLAHOMA CITY
AMARILLO
SAYRE
CHICKASHA
PURCELL
HOLDENVILLE
STIGLER
FT. SMITH
LE FLORE GAS & ELECTRIC CO.
McALESTER
ADA
HOLLIS
ALTUS
DUNCAN
SULPHUR
FREDERICK
WAURIKA
ARDMORE
DURANT
HUGO
OKAY
PARIS
TEXARKANA
PETROLIA
WICHITA FALLS
GAINESVILLE
ROSWELL
SULPHUR SPRINGS
GREENVILLE
SOUTH PLAINS PIPE LINE CO.
SOUTHERN TEXAS UTILITIES
LONE STAR GAS CO.
MERIDIAN GAS CO.
EMPIRE GAS & FUEL
ALLEN PL. CO.
PONTOTOC PL. CO.
S.W. GAS CO.


PORT HURON
CLEVELAND
TOLEDO
NORWALK
FINDLEY
MANSFIELD
LIMA
MARION
CHICAGO
MARION
MUNCIE
INDIANAPOLIS
FT MADISON
(EMPIRE PROPOSED)
PROPOSED CENTRAL STATES NAT'L. GAS CO.
CHILLICOTHE
CINCINNATI
PORTSMOUTH
COLUMBIA GAS & ELECTRIC
NEWTON
LOUISVILLE
FRANKFORT
CENT. KENTUCKY NAT. GAS
KENTUCKY PIPE LINE CO.
ST LOUIS
MURPHYSBORO
SPRINGFIELD
NASHVILLE
CHATTANOOGA
CLARKSVILLE
FT. SMITH
ARK. NAT. GAS CO.
MEMPHIS
LITTLE ROCK
HOT SPRINGS
PINE BLUFF
FORDYCE
CAMDEN
OKAY
ELDORADO
ROME
ATLANTA
MACON
BIRMINGHAM
WEST POINT
SELMA
MONTGOMERY
MISSISSIPPI VALLEY FUEL
MEMPHIS NATURAL GAS CO.
SOUTHERN NATURAL GAS CO.
ARKANSAS NATURAL GAS CO.
ARK-LA
A.N.G. CO.
OHIO FUEL & SUP. CO.
COLUMBIA MANUFACTURERS GAS CO.
EAST OHIO GAS CO.
ILLINOIS
INDIANA
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
ARKANSAS
MISSOURI


CANADIAN RIVER GAS CO.
DALHAM
DUMAS
PAMPA
WHEELER
AMARILLO
EMPIRE GAS
CONSOLIDATED GAS CO.
SAYRE
CONSOLIDATED GAS CO.
LONE STAR GAS CO
MERIDIAN GAS CO.
HOLLIS
ALTUS
SOUTH PLAINS PIPE LINE CO.
WEST TEXAS GAS CO.
ROSWELL
PECOS VALLEY GAS CO.
CARLSBAD
JAL
NATURAL GAS CO.
MIDLAND
STILLWATER
O.N.G.
TULSA
WAGONER
GUTHRIE
OKLA NAT. GAS
EMPIRE
MUSKOGEE
OKLA. NAT. GAS CO.
EL RENO
OKLAHOMA CITY
GAS
WESTERN NAT.
STIGLER
EMPIRE GAS & FUEL
HOLDENVILLE
McALESTER GAS CO
McALESTER
CHICKASHA
OKLA NAT GAS
PURCELL
LONE STAR
ALLEN P.L. CO.
ADA
PONTOTOC P.L. CO
DUNCAN
SULPHUR
OKLA. NAT. GAS CO
FREDERICK
LONE STAR
WAURIKA
ARDMORE
DURANT
HUGO
NORTHERN TEXAS UTILITIES
PETROLIA
WICHITA FALLS
LONE STAR GAS CO.
PARIS
GAINESVILLE
U.S. GOV'T.
LONE STAR GAS CO.
SULPHUR SPRINGS
GREENVILLE
STAMFORD
LONE STAR
WESTERN GAS CO.
BRECKENRIDGE
FORT WORTH
DALLAS
MAGNOLIA
DIXIE GULF GAS CO.
SNYDER
LONE STAR GAS CO.
LONE STAR GAS CO.
TYLER
COLORADO
SWEETWATER
ABILENE
EASTLAND
CLEBURNE
KERENS
GLENROSE
CORSICANA
LONE STAR GAS CO.
COLEMAN
BROWNWOOD
OKLA. NAT. GAS CO.
SAN ANGELO
WACO
MEXIA
TEAGUE
GATESVILLE
GROESBECK
LONE STAR GAS CO.
BELTON
HUNTSVILLE
ROCKDALE
BRYAN
ROUND ROCK
AUSTIN
LOCKHART
HOUSTON
SAN ANTONIO
SO. NAT. GAS CO.
HONDO
S.W. PIPE LINE CO.
CUERO
EDNA
GAS CO.
SOUTHERN NAT. GAS CO.
HOUSTON PIPE LINE CO.
HOUSTON GULF GAS CO.
LAREDO
BORDER GAS CO.
HEBBRONVILLE
RIO GRAND VALLEY GAS CO.
BROWNSVILLE
O K L A H O M A
T E X A S
I C O

CHATTANOOGA
MEMPHIS
CLARKSVILLE
FT. SMITH
ARK. NAT. GAS CO.
ARKANSAS
LITTLE ROCK
HOT SPRINGS
PINE BLUFF
FORDYCE
OKAY
CAMDEN
TEXARKANA
ELDORADO
ARK. NAT. GAS CO.
SOUTHERN NATURAL GAS CO.
SHREVEPORT
PALMER
MONROE
RESERVE
GULF REF. CO.
NATCHITOCHES
ALEXANDRIA
MERIDIAN
WEST POINT
BIRMINGHAM
ROME
ATLANTA
SELMA
MONTGOMERY
BATON ROUGE
NEW ORLEANS
BEAUMONT
ORANGE
PORT ARTHUR

s Map

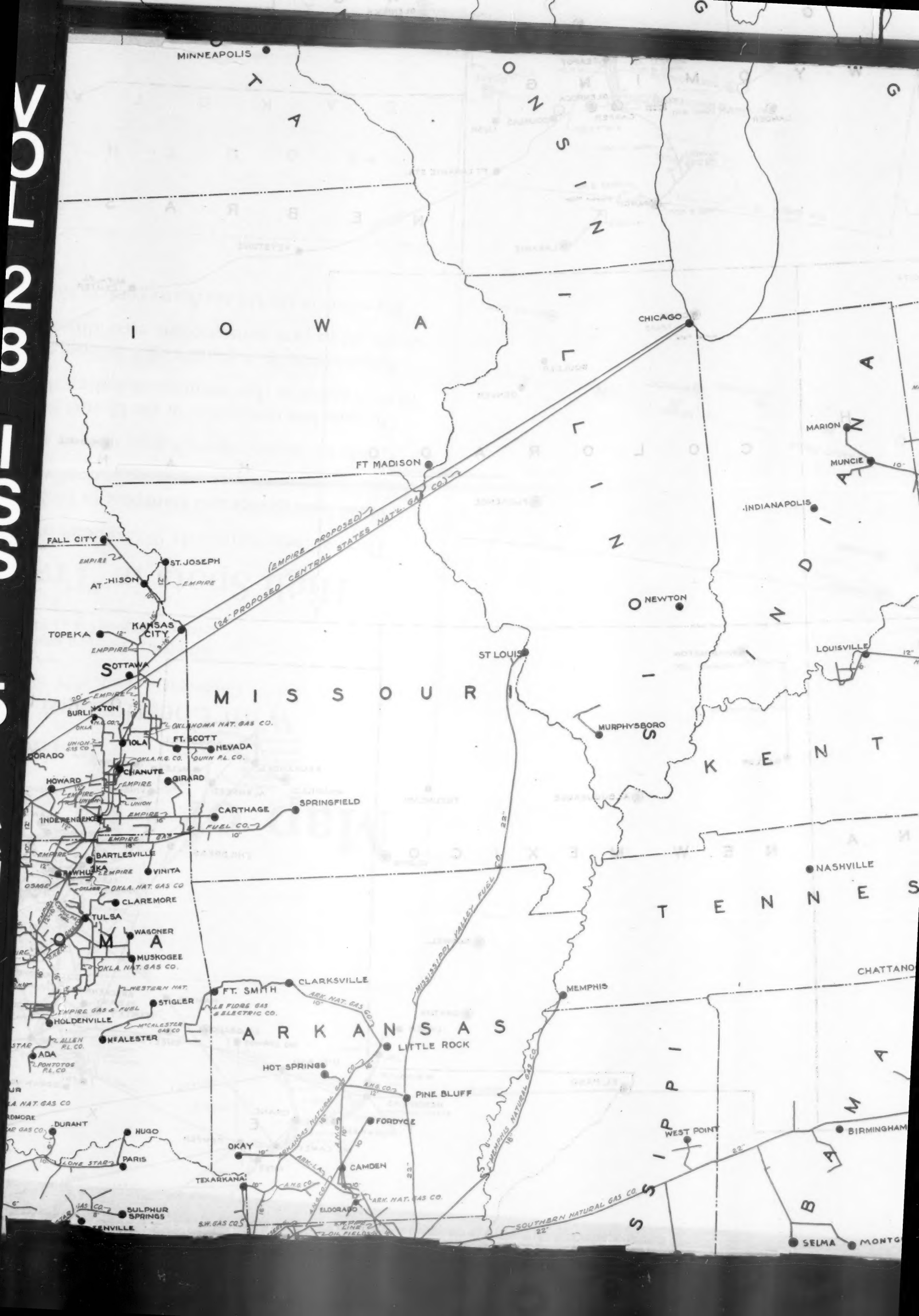
nes

ved and reproduction in nal.

gas last year totaled

per cent of the nation's

MAINE
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
RHODE
CONNECTICUT
YORK
W
NIAGARA FALLS
EMPIRE
BUFFALO
IROQUOIS
BATAVIA
LIMA
EMPIRE
IROQUOIS
NIAGARA FALLS
EMPIRE
EMPIRE


MINNEAPOLIS
IOWA
CHICAGO
FT MADISON
(EMPIRE PROPOSED)
(24" PROPOSED CENTRAL STATES NAT'L. GAS CO.)
MARION
MUNCIE
INDIANAPOLIS
FALL CITY
ST. JOSEPH
ATCHISON
EMPIRE
NEWTON
TOPEKA
KANSAS CITY
ST LOUIS
LOUISVILLE
OTTAWA
MISSOURI
BURLINGTON
OKLAHOMA NAT. GAS CO.
IOLA
FT. SCOTT
NEVADA
OKLA. N.G. CO.
DUNN P.L. CO.
CHANUTE
GIRARD
HOWARD
INDEPENDENCE
CARTHAGE
SPRINGFIELD
FUEL CO.
BARTLESVILLE
VINITA
OKLA. NAT. GAS CO
CLAREMORE
TULSA
WAGONER
MUSKOGEE
OKLA. NAT. GAS CO.
MURPHYSBORO
KENTUCKY
NASHVILLE
TENNESSEE
CHATTANOOGA
MISSISSIPPI VALLEY FUEL CO.
MEMPHIS
CLARKSVILLE
FT. SMITH
ARK. NAT. GAS CO.
WESTERN NAT.
STIGLER
LE FLORE GAS & ELECTRIC CO.
EMPIRE GAS & FUEL
HOLDENVILLE
McALESTER
McALESTER GAS CO
ARKANSAS
LITTLE ROCK
HOT SPRINGS
ARKANSAS NATURAL GAS CO.
PINE BLUFF
FORDYCE
MISSISSIPPI
MEMPHIS NATURAL GAS CO.
WEST POINT
BIRMINGHAM
ADA
PONTOTOC P.L. CO.
DURANT
HUGO
PARIS
LONE STAR
OKAY
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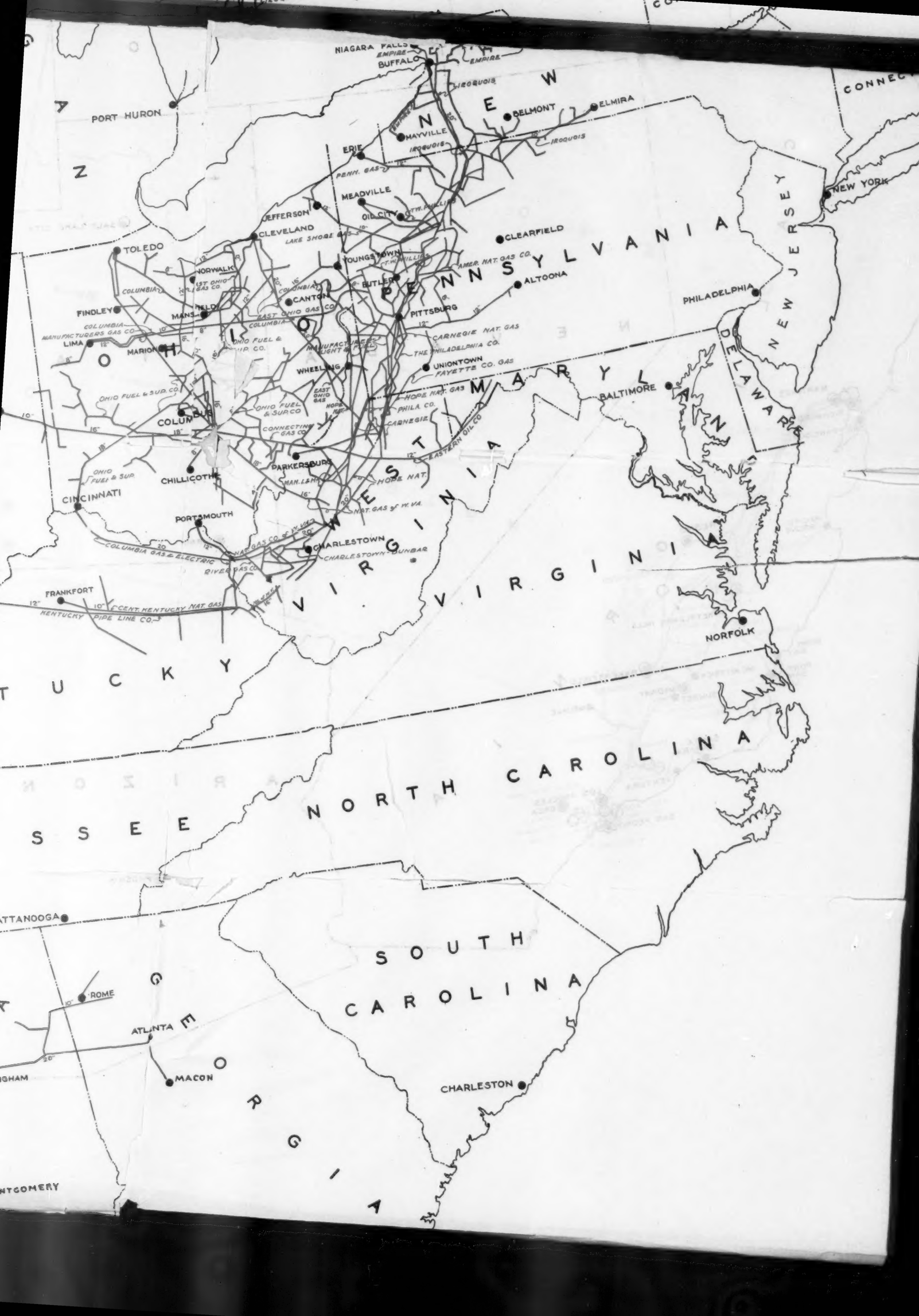
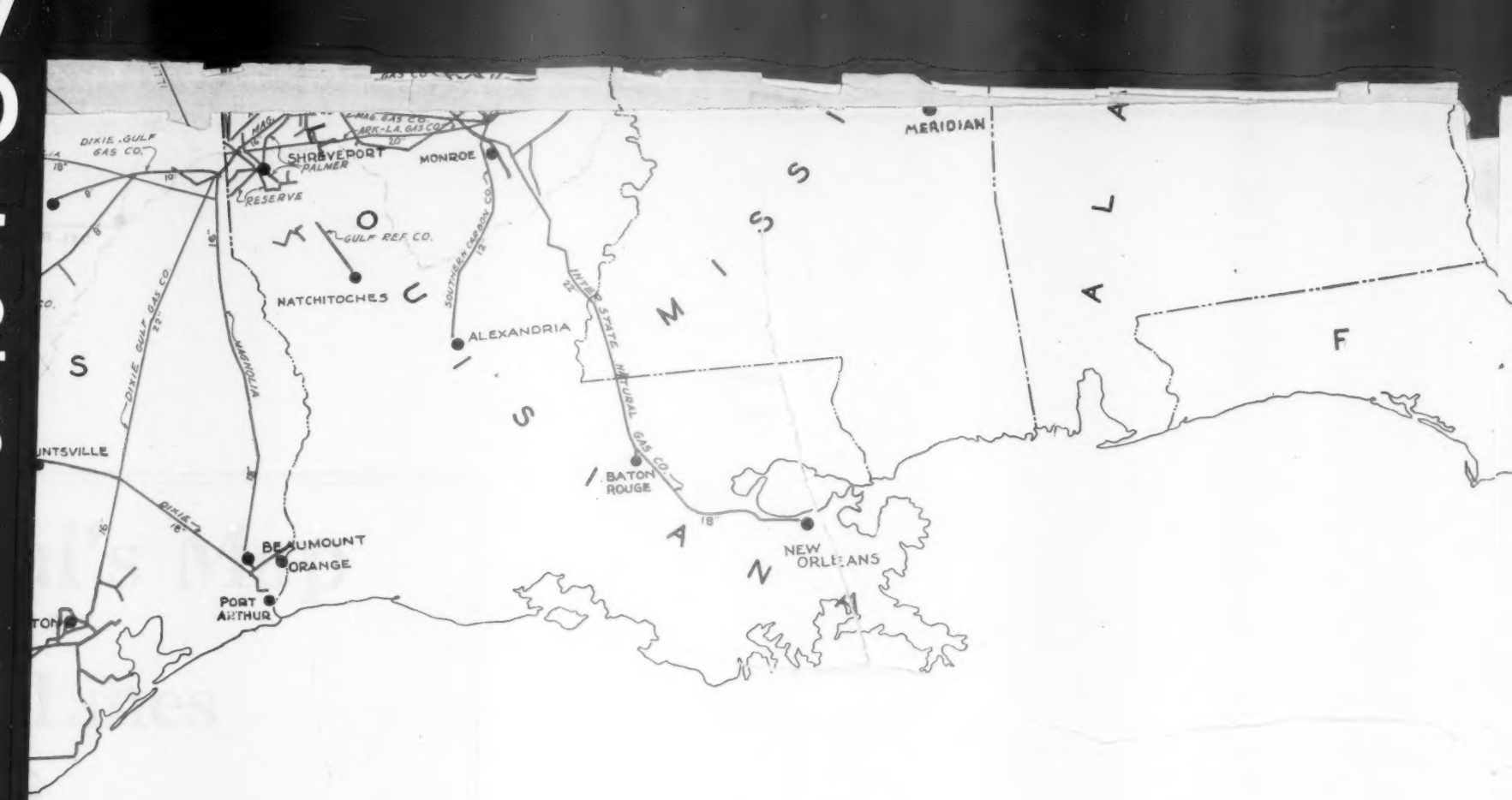
TEXARKANA
ELDORADO
ARK. NAT. GAS CO.
SULPHUR SPRINGS
SOUTHERN NATURAL GAS CO.
SELMA
MONTG


NIAGARA FALLS
EMPIRE
BUFFALO
EMPIRE
IROQUOIS
PORT HURON
BELMONT
ELMIRA
MAYVILLE
IROQUOIS
IROQUOIS
ERIE
PENN. GAS
MEADVILLE
JEFFERSON
OIL CITY
CTW. PHILLIPS
CLEVELAND
LAKE SHORE GAS
CLEARFIELD
TOLEDO
YOUNGSTOWN
CT.W. PHILLIPS
AMER. NAT. GAS CO.
NORWALK
UNT. OHIO NAT. GAS CO.
COLUMBIA
BUTLER
ALTOONA
CANTON
EAST OHIO GAS CO
PITTSBURG
PHILADELPHIA
FINDLEY
COLUMBIA
MANUFACTURERS GAS CO.
CARNEGIE NAT. GAS
LIMA
MARION
OHIO FUEL & SUP. CO.
THE PHILADELPHIA CO.
WHEELING
UNIONTOWN
FAYETTE CO. GAS
NEW JERSEY
DELAWARE
HOPE NAT. GAS
BALTIMORE
OHIO FUEL & SUP. CO
EAST OHIO GAS
HOPE NAT.
PHILA. CO.
CARNEGIE
CONNECTING GAS CO
EASTERN OIL CO
PARKERSBURG
CHILLICOTHE
OHIO FUEL & SUP.
MAN. LIGHT
HOPE NAT.
CINCINNATI
NAT. GAS OF W. VA.
PORTSMOUTH
CHARLESTOWN
CHARLESTOWN-DUNBAR
COLUMBIA GAS & ELECTRIC
RIVER GAS CO.
NAT. GAS CO. OF W. VA.
FRANKFORT
CENT. KENTUCKY NAT. GAS
KENTUCKY PIPE LINE CO.
NORFOLK
ROME
ATLANTA
MACON
CHARLESTON
OHIO
PENNSYLVANIA
WEST VIRGINIA
VIRGINIA
MARYLAND
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA


DIXIE GULF GAS CO.
SHREVEPORT
PALMER
RESERVE
MONROE
GULF REF. CO.
NATCHITOCHES
ALEXANDRIA
SOUTHERN NATURAL GAS CO.
INTERSTATE NATURAL GAS CO.
MERIDIAN
BATON ROUGE
NEW ORLEANS
BEAUMONT
ORANGE
PORT ARTHUR
MAGNOLIA
DIXIE

BRUNSWICK
L
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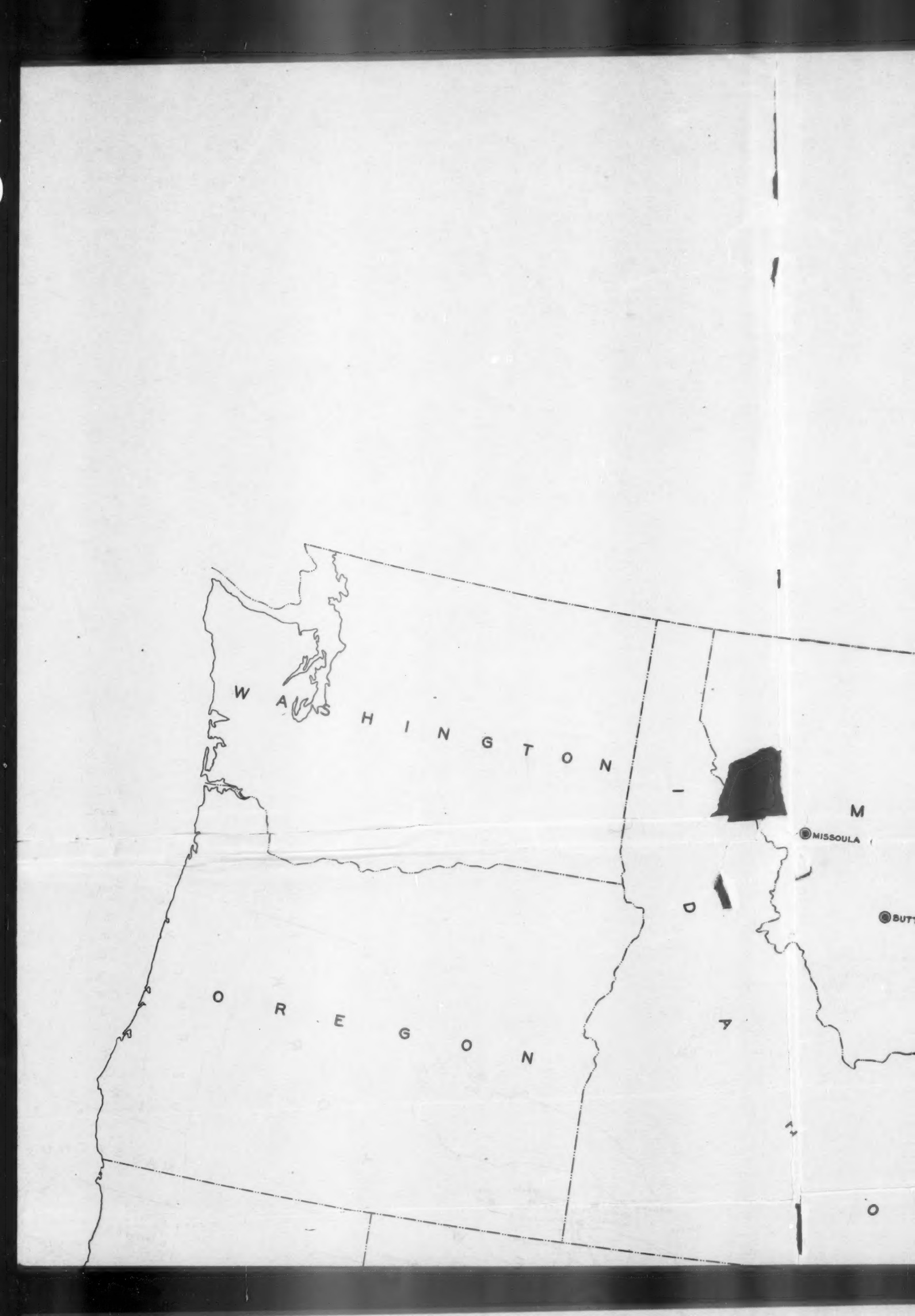
TAMPA


WASHINGTON
OREGON
MISSOULA

The Oi
PRODUCING

Map of Oil

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With Locations o

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without express per

High Spots in Tr

There are approximately 99,000 miles

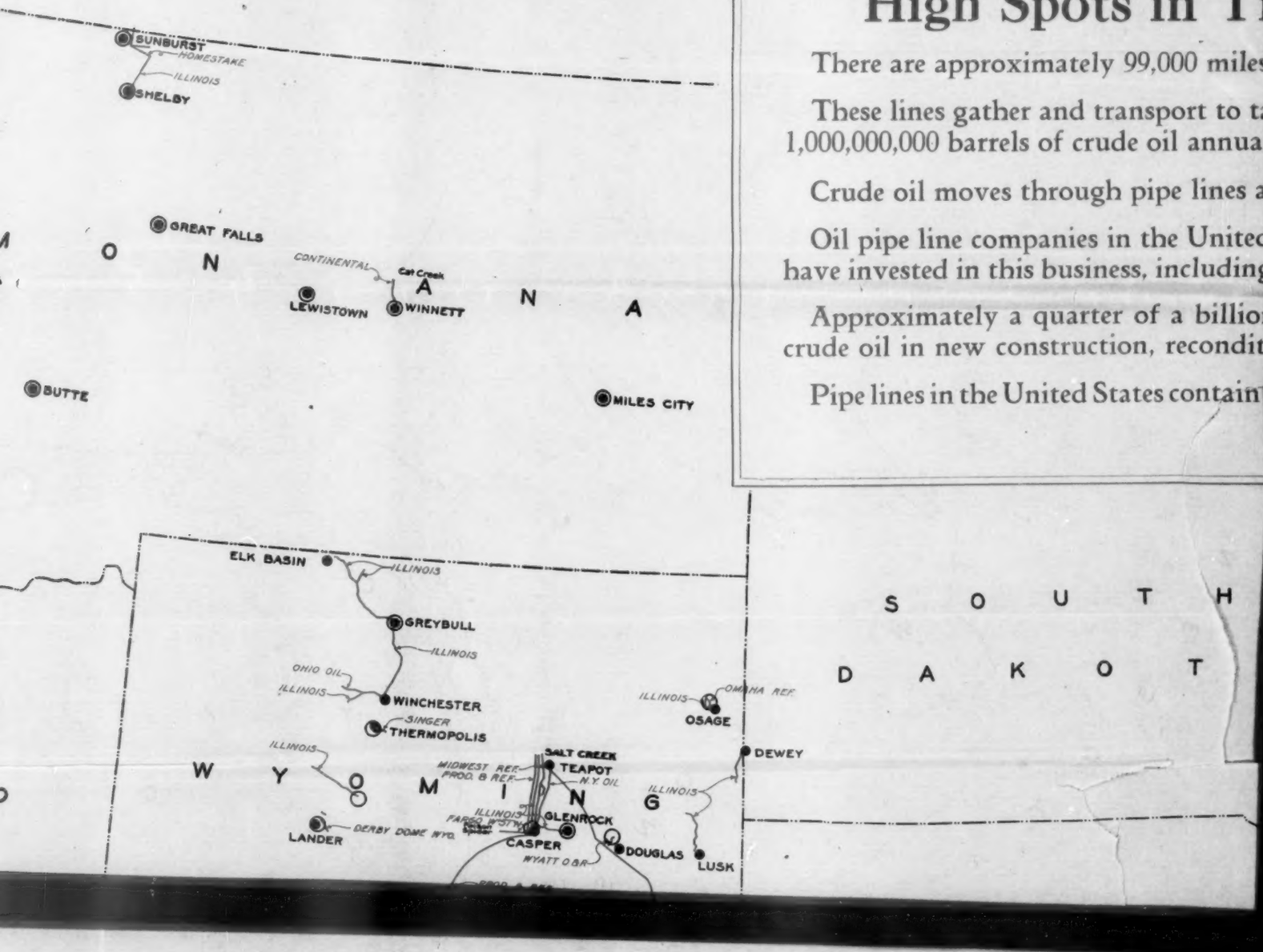
These lines gather and transport to ta
1,000,000,000 barrels of crude oil annual

Crude oil moves through pipe lines a

Oil pipe line companies in the United
have invested in this business, including

Approximately a quarter of a billion
crude oil in new construction, recondit

Pipe lines in the United States contain



The OIL
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Map of Oil T

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With Locations of

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crude oil in new construction, recondition

Pipe lines in the United States contain sli

OIL and GAS JOURNAL
NG REFINING ENGINEERING MARKETING

l Trunk Pipe Lines

n the United States

s of Refineries Shown by Circles

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Transportation of Petroleum

miles of oil trunk and gathering pipe lines in the United States.

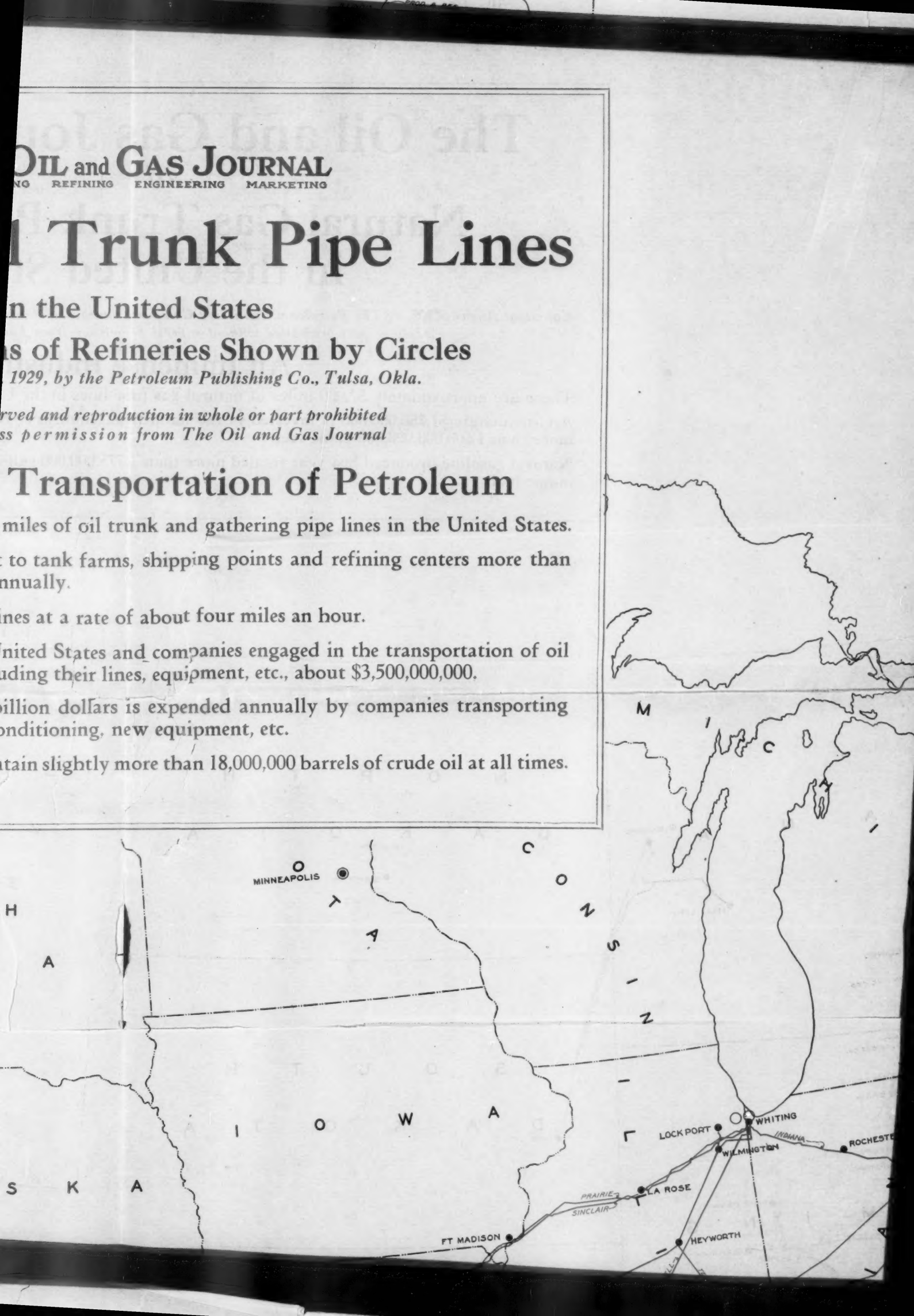
to tank farms, shipping points and refining centers more than nnually.

ines at a rate of about four miles an hour.

nited States and companies engaged in the transportation of oil uding their lines, equipment, etc., about $3,500,000,000.

illion dollars is expended annually by companies transporting onditioning, new equipment, etc.

tain slightly more than 18,000,000 barrels of crude oil at all times.



OIL and GAS JOURNAL
NG REFINING ENGINEERING MARKETING

l Trunk Pipe Lines

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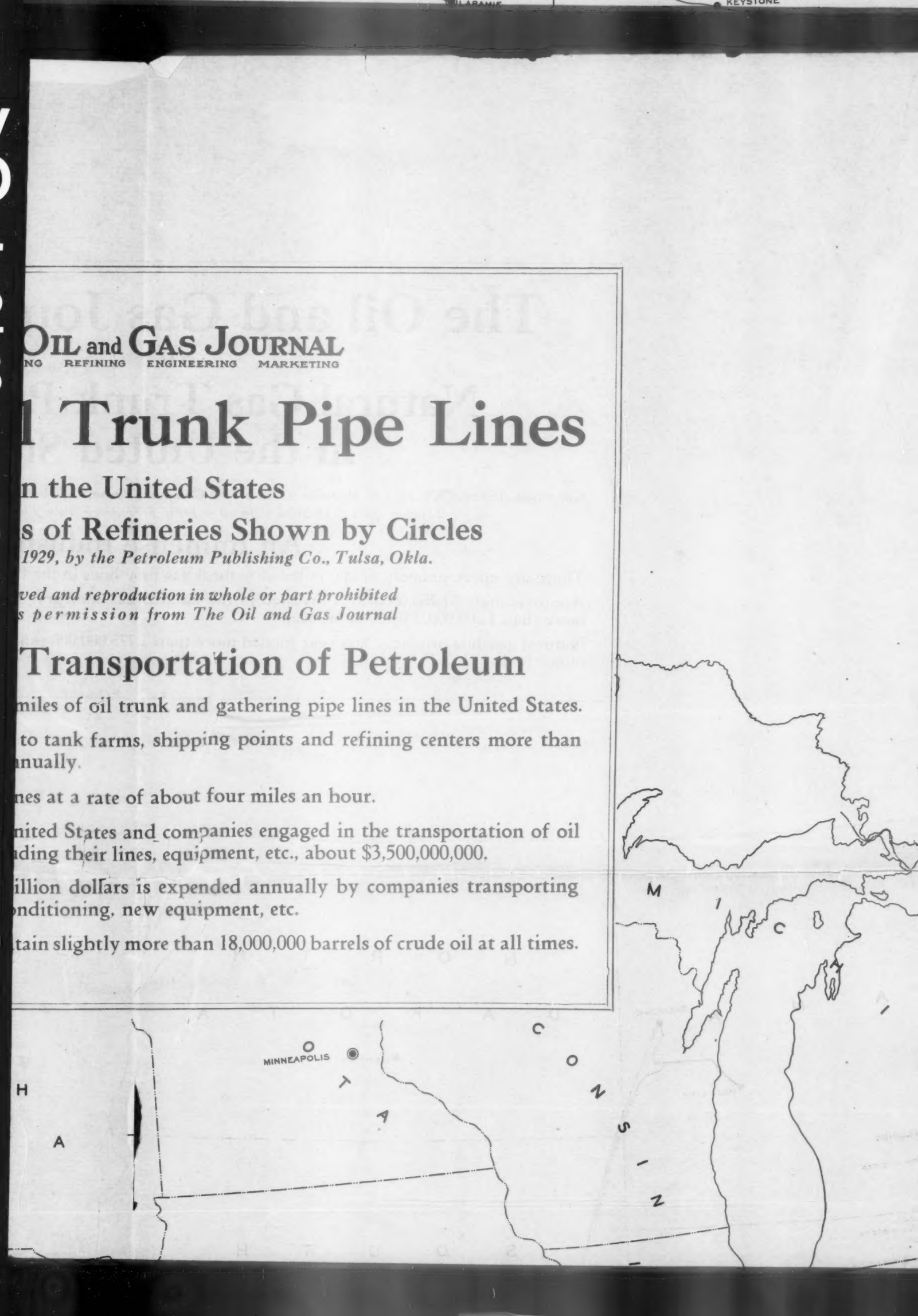

VERMONT
NEW HAMPSHIRE
MASSACH
PROVIDEN
CONNECTICUT
NEW YORK
BUFFALO
HALES EDDY
NEW YORK TRANSIT
ATHENS
OLEAN
WELLSVILLE
BRADFORD
PORT HURON
WILLIAMSPORT
WILBURINE
TIDEWATER
NATIONAL TRANSIT
NORTHERN
TIDEWATER
OIL CITY
NAT. TRANS.
NORTHERN
CLEVELAND
TOLEDO
BUTLER
LEBANON
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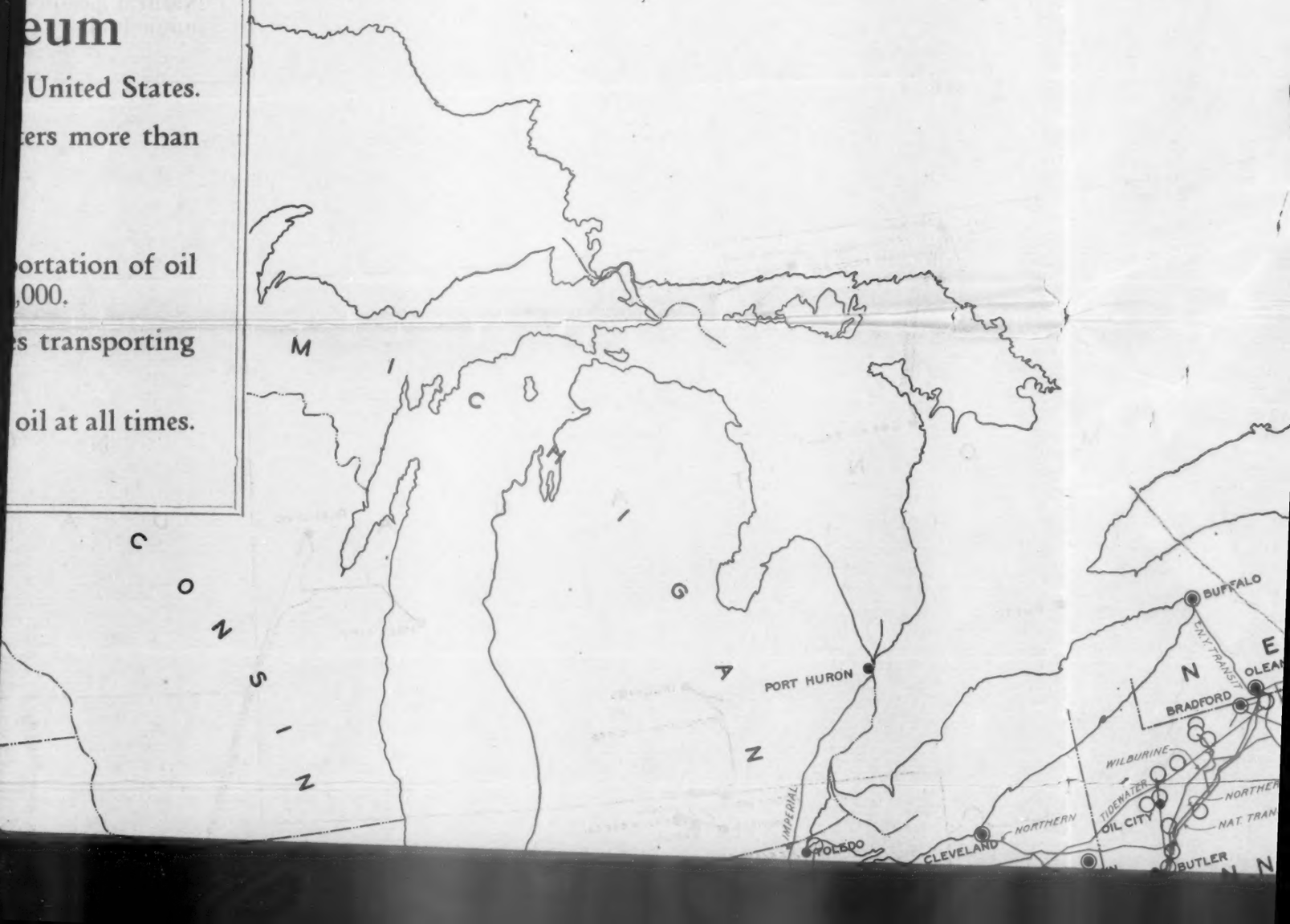

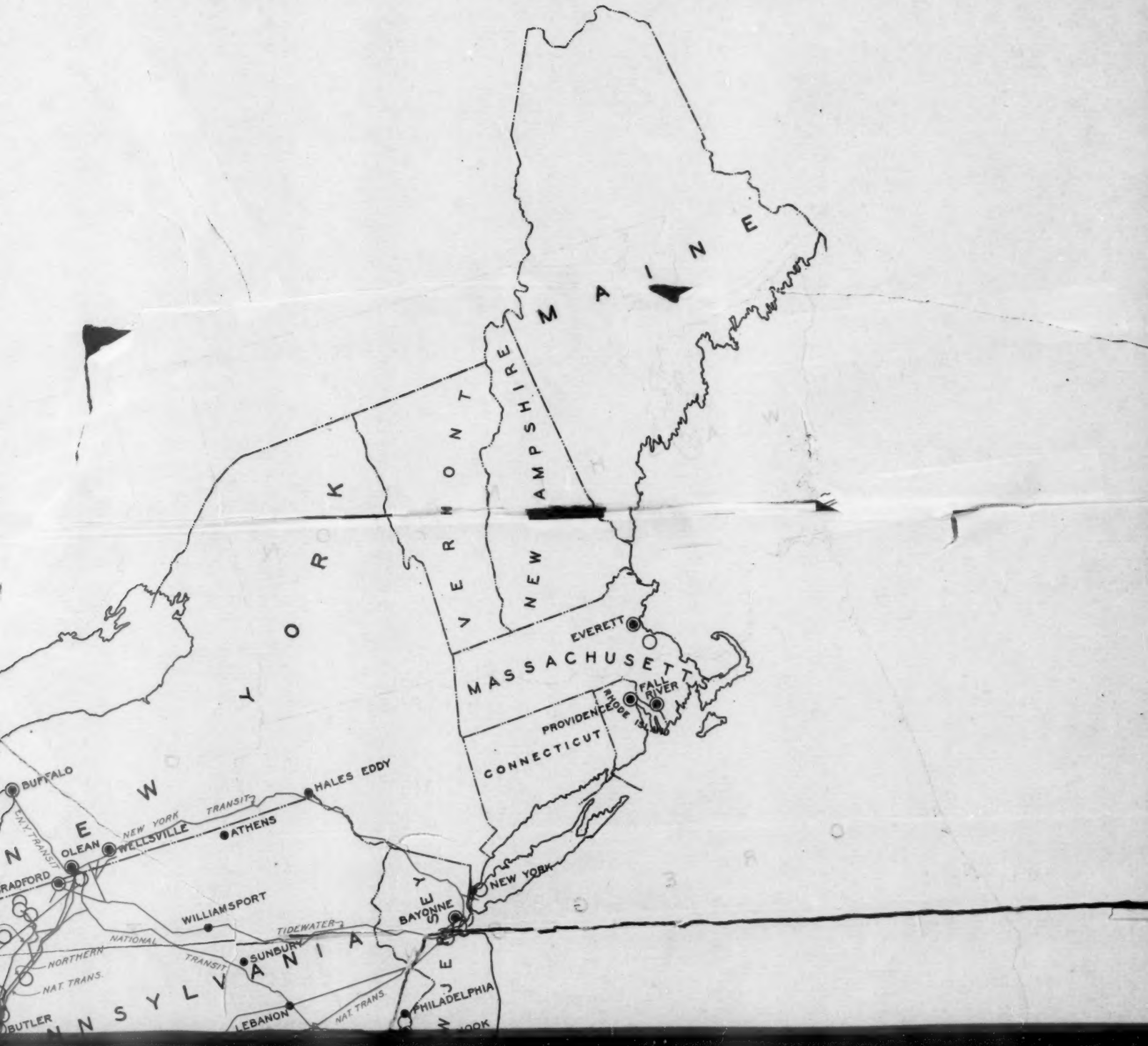
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WELLSVILLE
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N.Y. TRANSIT
BRADFORD
WILLIAMSPORT
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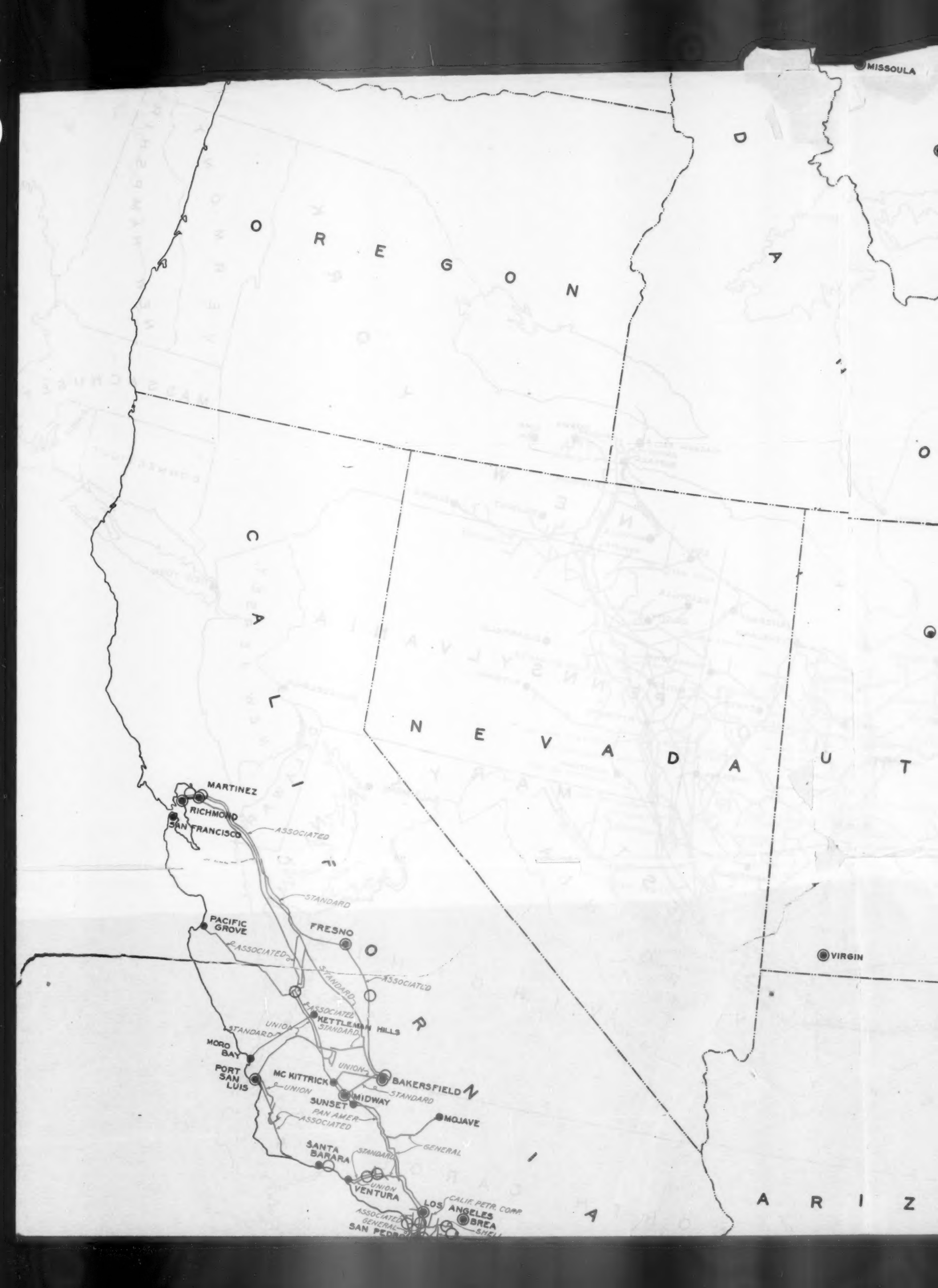
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KETTLEMAN HILLS
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MORO BAY
PORT SAN LUIS
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MC KITTRICK
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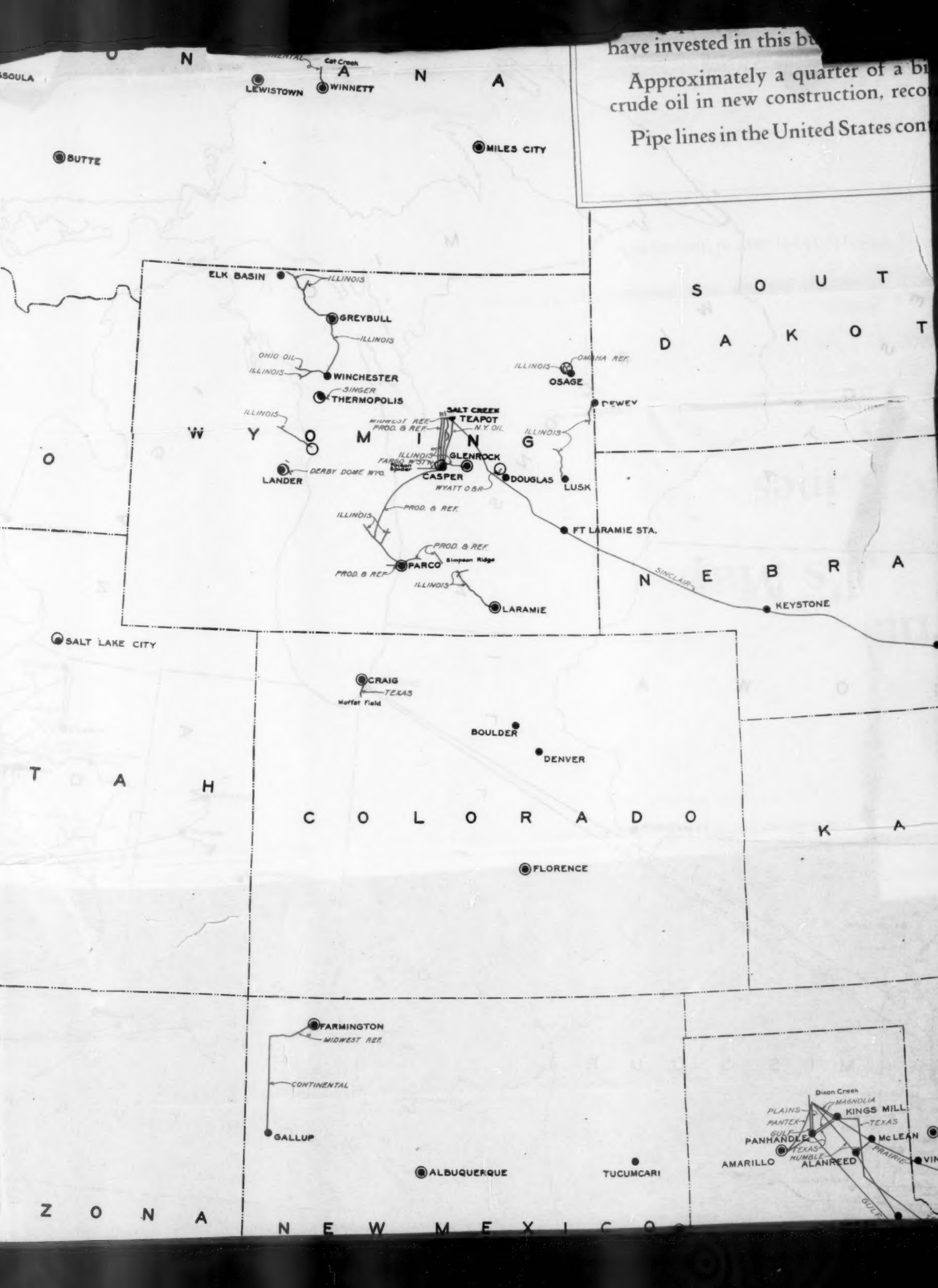
Pipe lines in the United States con



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Approximately a quarter of a billion dollars is expended a
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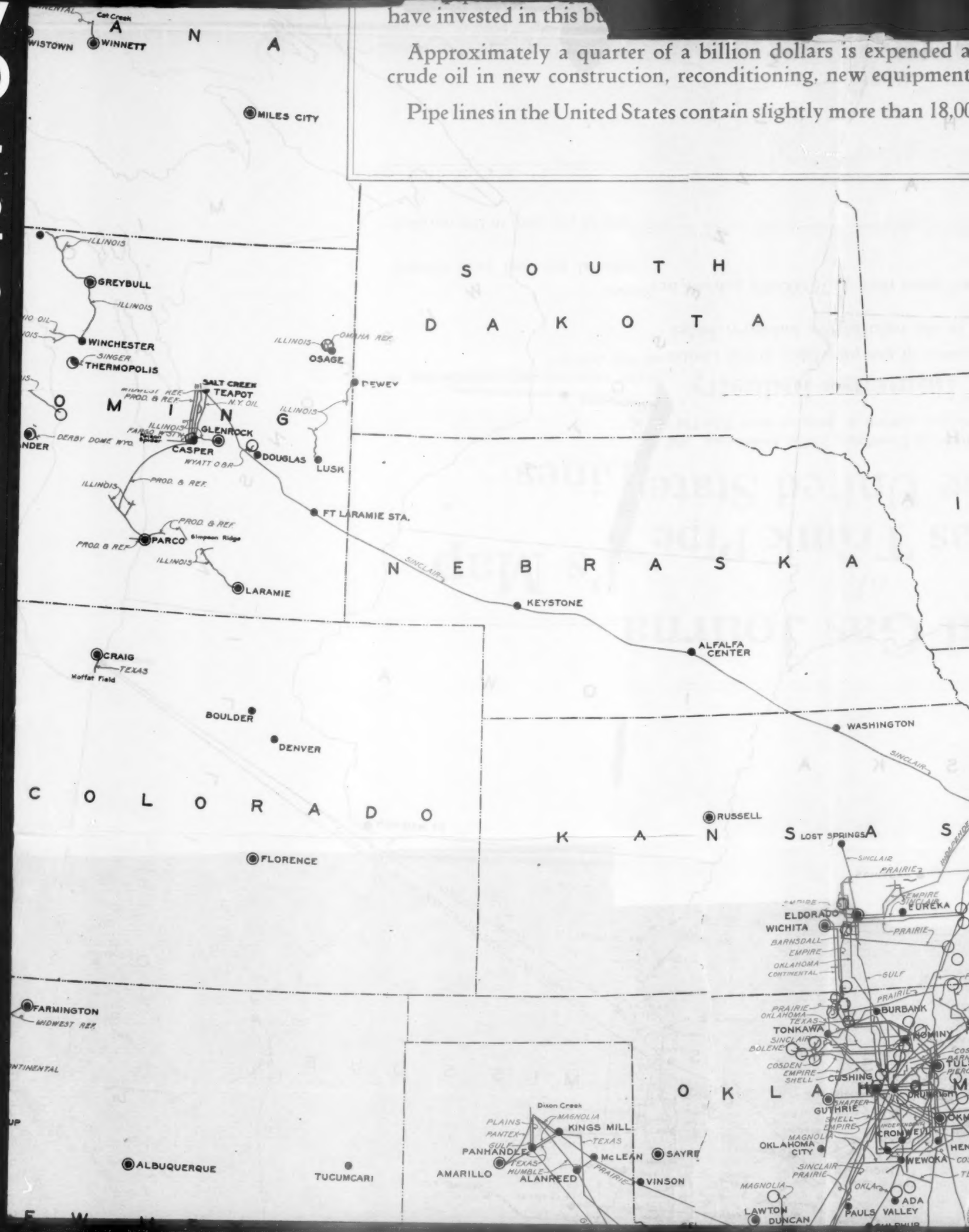
Pipe lines in the United States contain slightly more than 18,00



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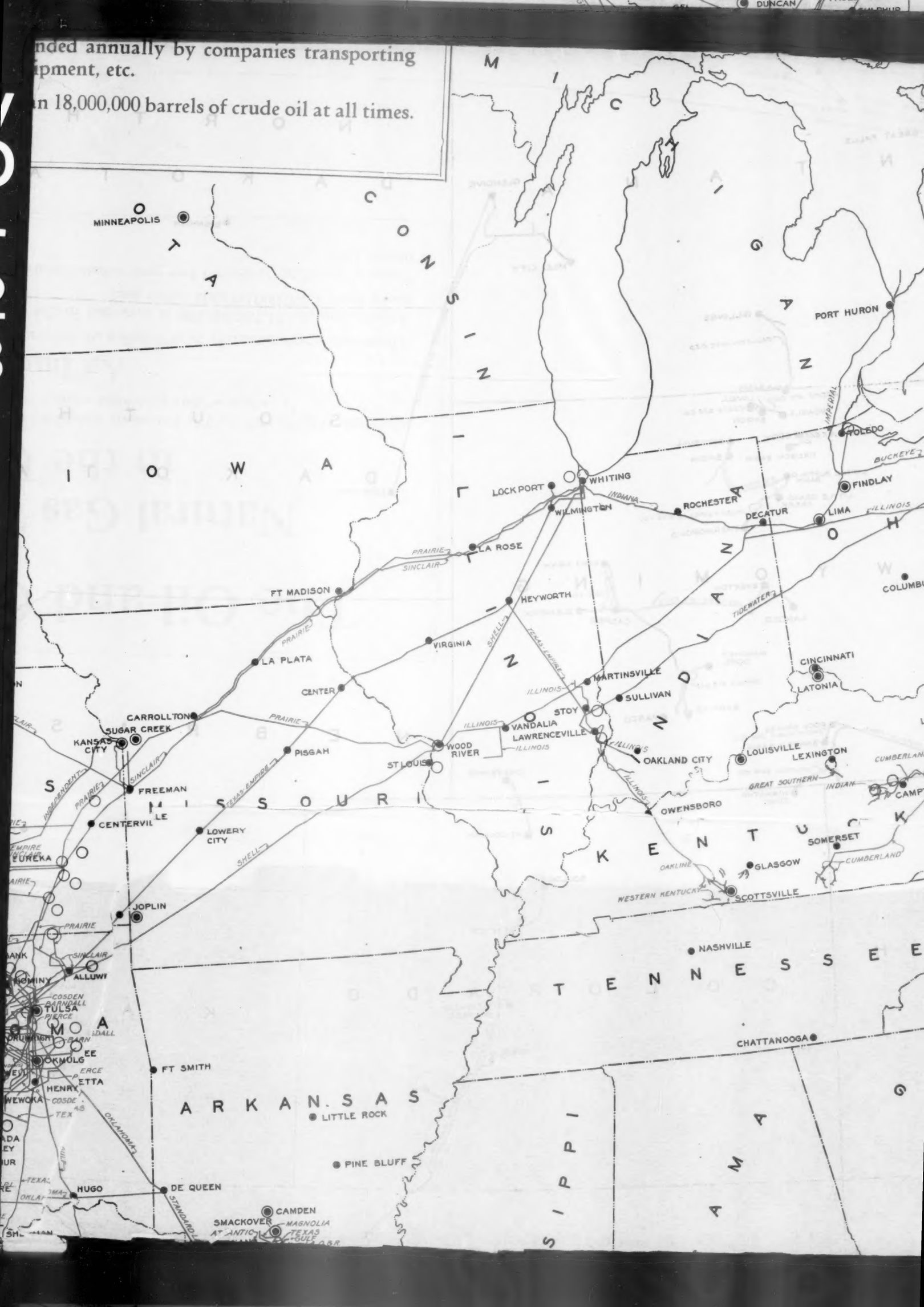
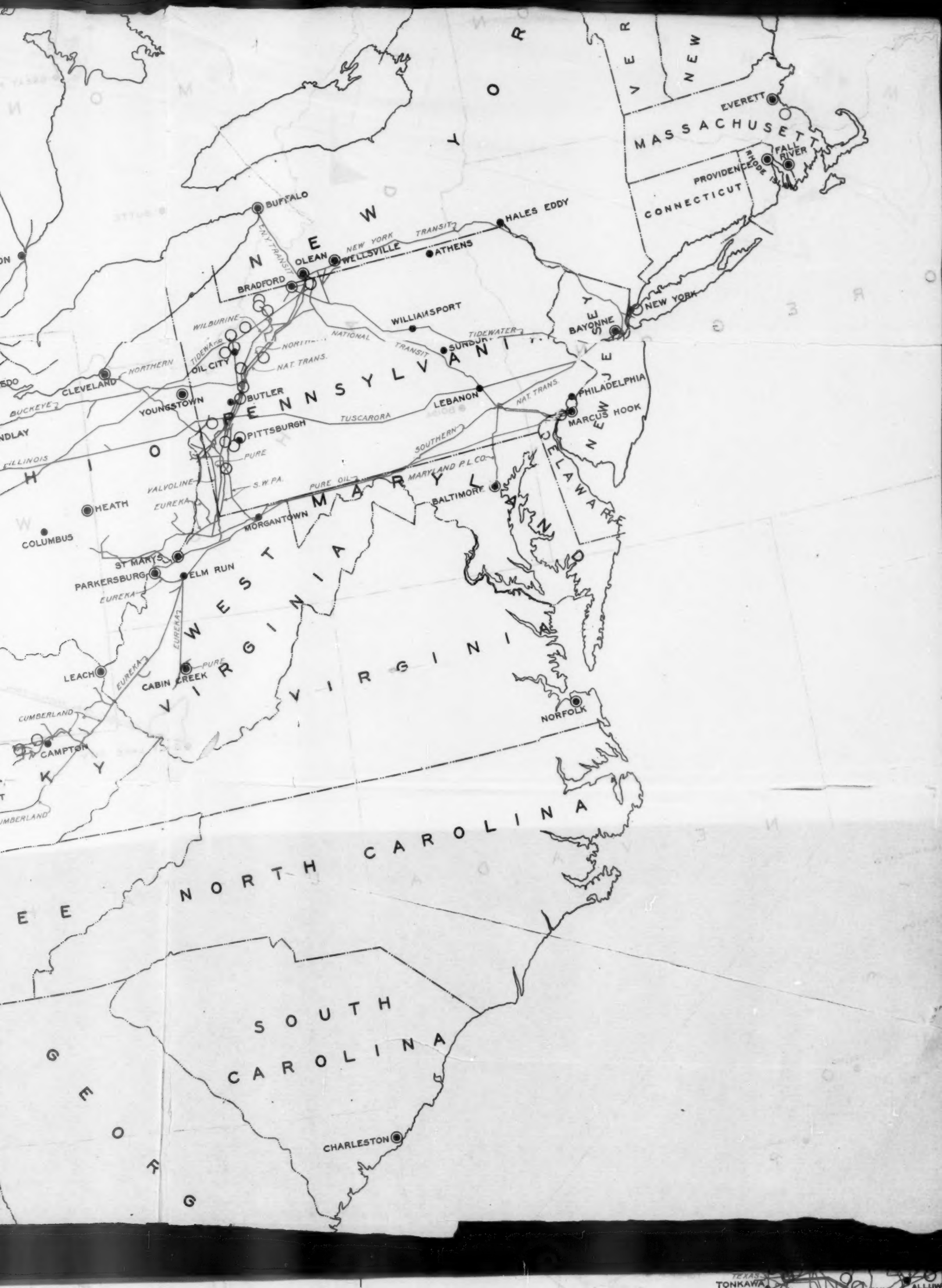
n 18,000,000 barrels of crude oil at all times.

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WILLIAMSPORT
NATIONAL TRANSIT
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NEW YORK
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WILBURINE
TIDEWATER
OIL CITY
NORTHERN
NAT. TRANS.
CLEVELAND
BUCKEYE
YOUNGSTOWN
BUTLER
LEBANON
PHILADELPHIA
MARCUS HOOK
TUSCARORA
PITTSBURGH
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VALVOLINE
S.W.PA.
PURE OIL
EUREKA
HEATH
BALTIMORE
DELAWARE
MORGANTOWN
COLUMBUS
ST MARYS
PARKERSBURG
ELM RUN
EUREKA
WEST VIRGINIA
VIRGINIA
LEACH
CABIN CREEK
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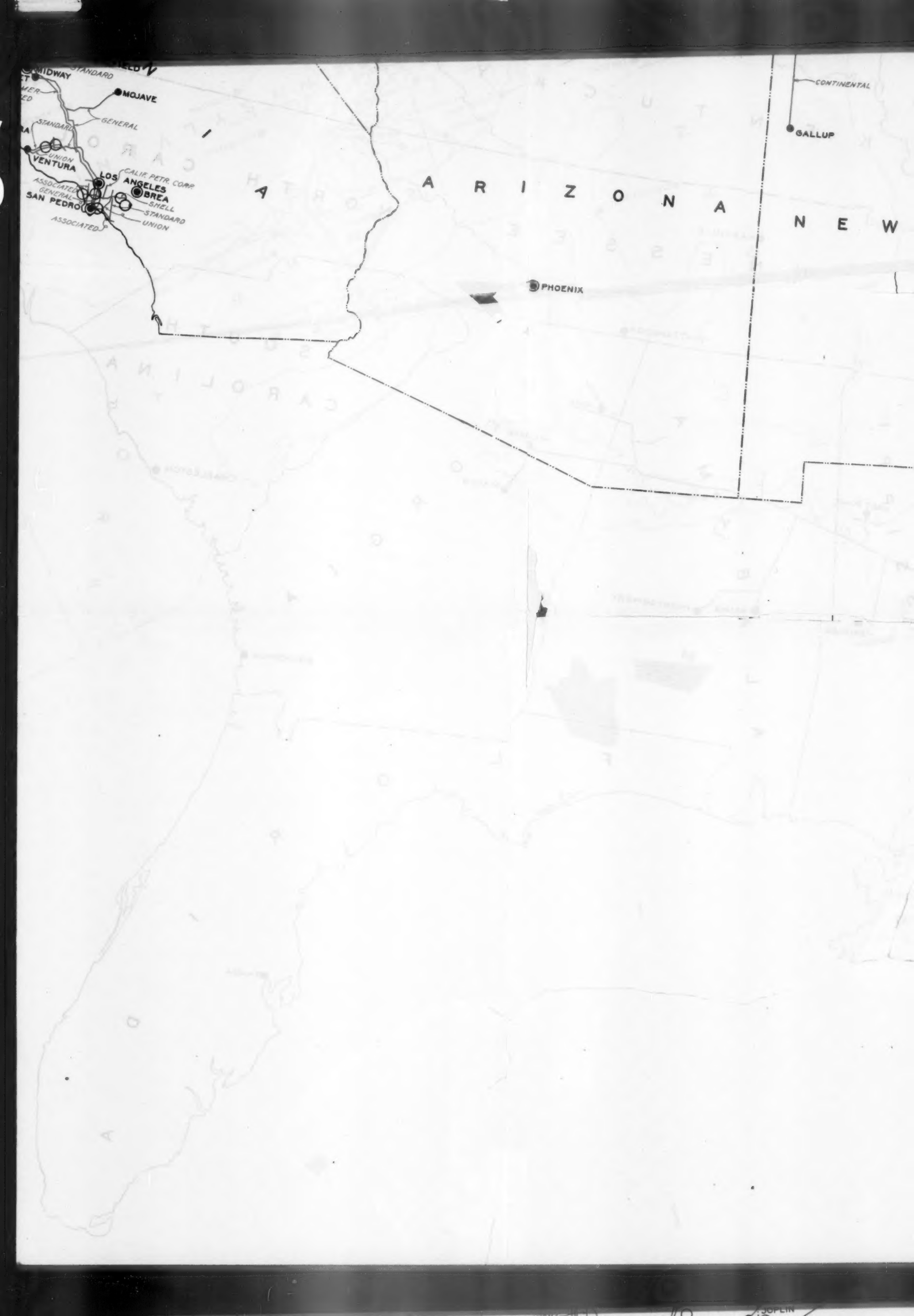
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THOMPSONVILLE
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BOWIE
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ARDMORE
SULPHUR
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CUSHING
TONKAWA
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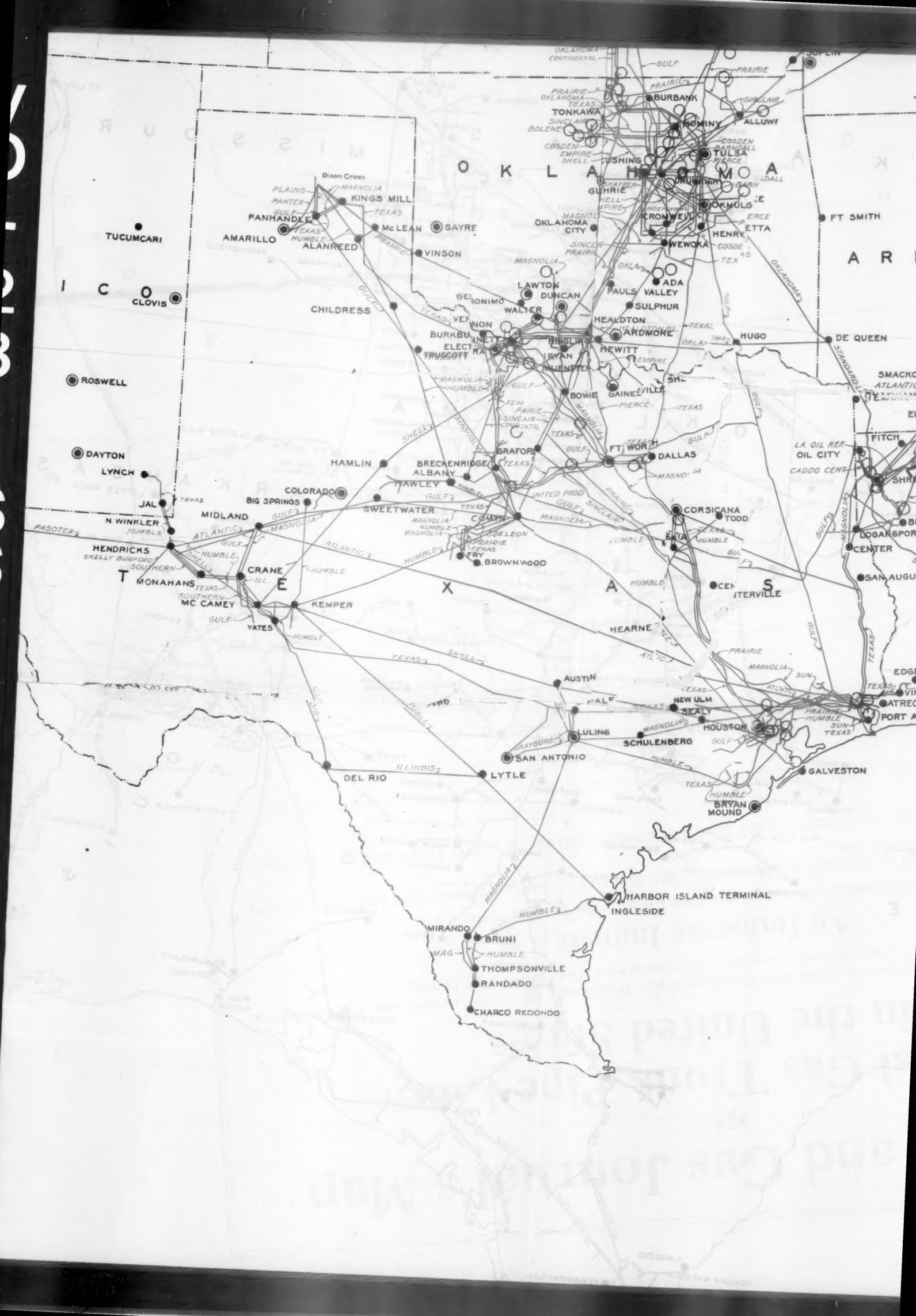
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SAN AUGUSTINE
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OIL CITY
LA. OIL REF.
AUSTIN
HEARNE
NEW ULM
SEALY
HOUSTON
LULING
SCHULENBERG
GRAYBURG
SAN ANTONIO
LYTLE
DEL RIO
GALVESTON
BRYAN MOUND
HARBOR ISLAND TERMINAL
INGLESIDE
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RANDADO
CHARCO REDONDO
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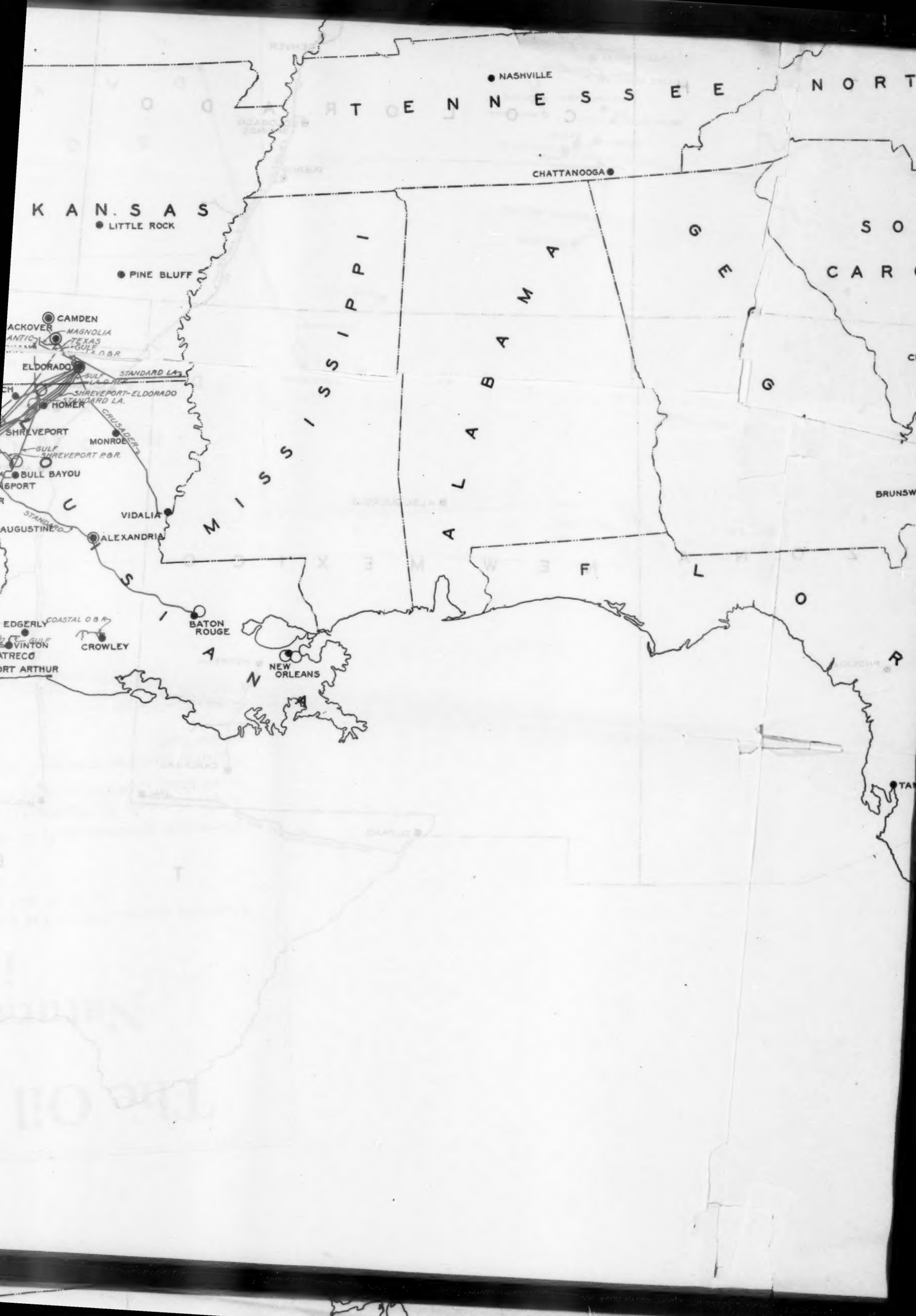
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ELDORADO
STANDARD LA.
SHREVEPORT-ELDORADO
HOMER
SHREVEPORT
MONROE
CRUSADER
GULF SHREVEPORT P.&R.
BULL BAYOU
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VINTON
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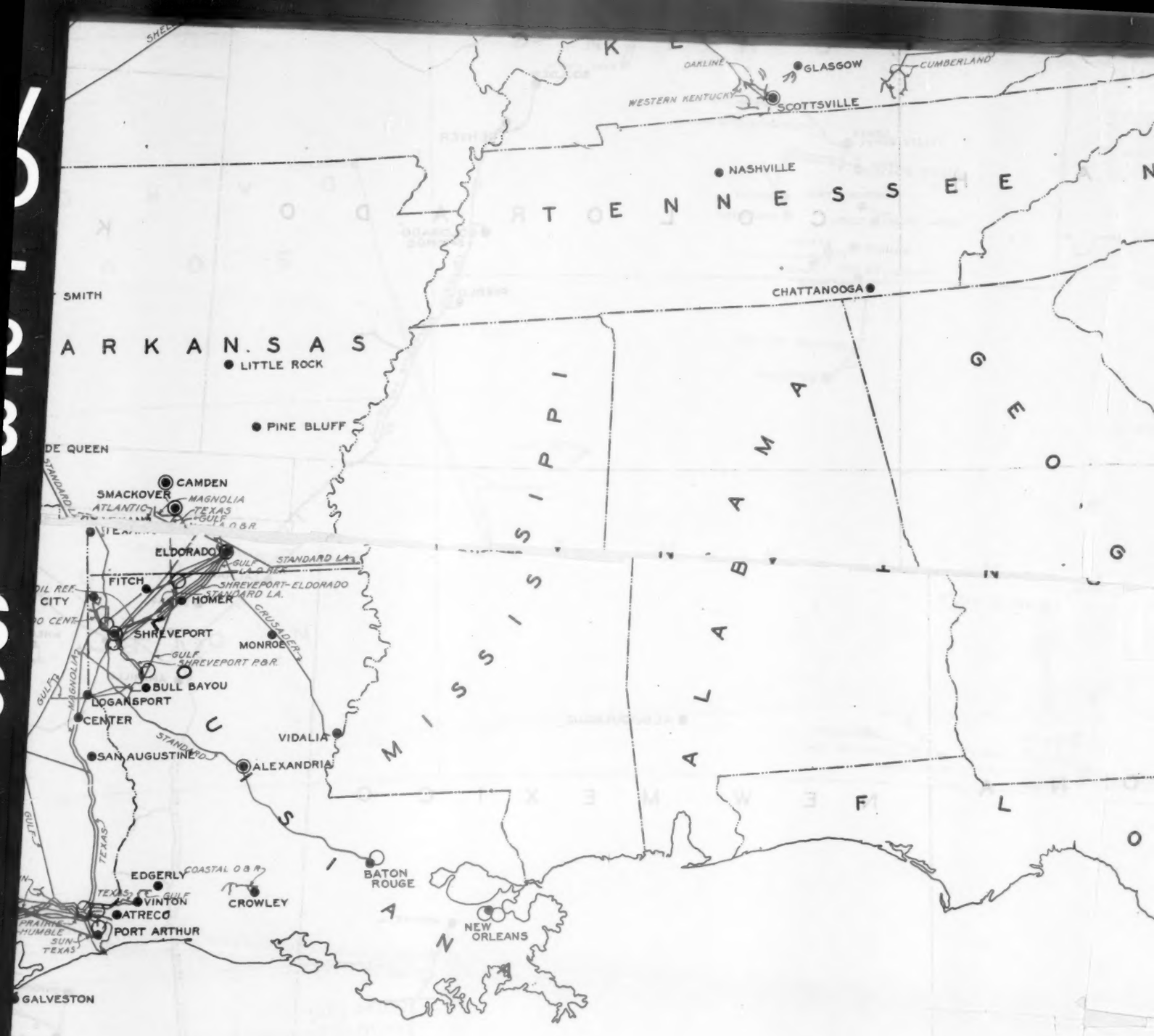
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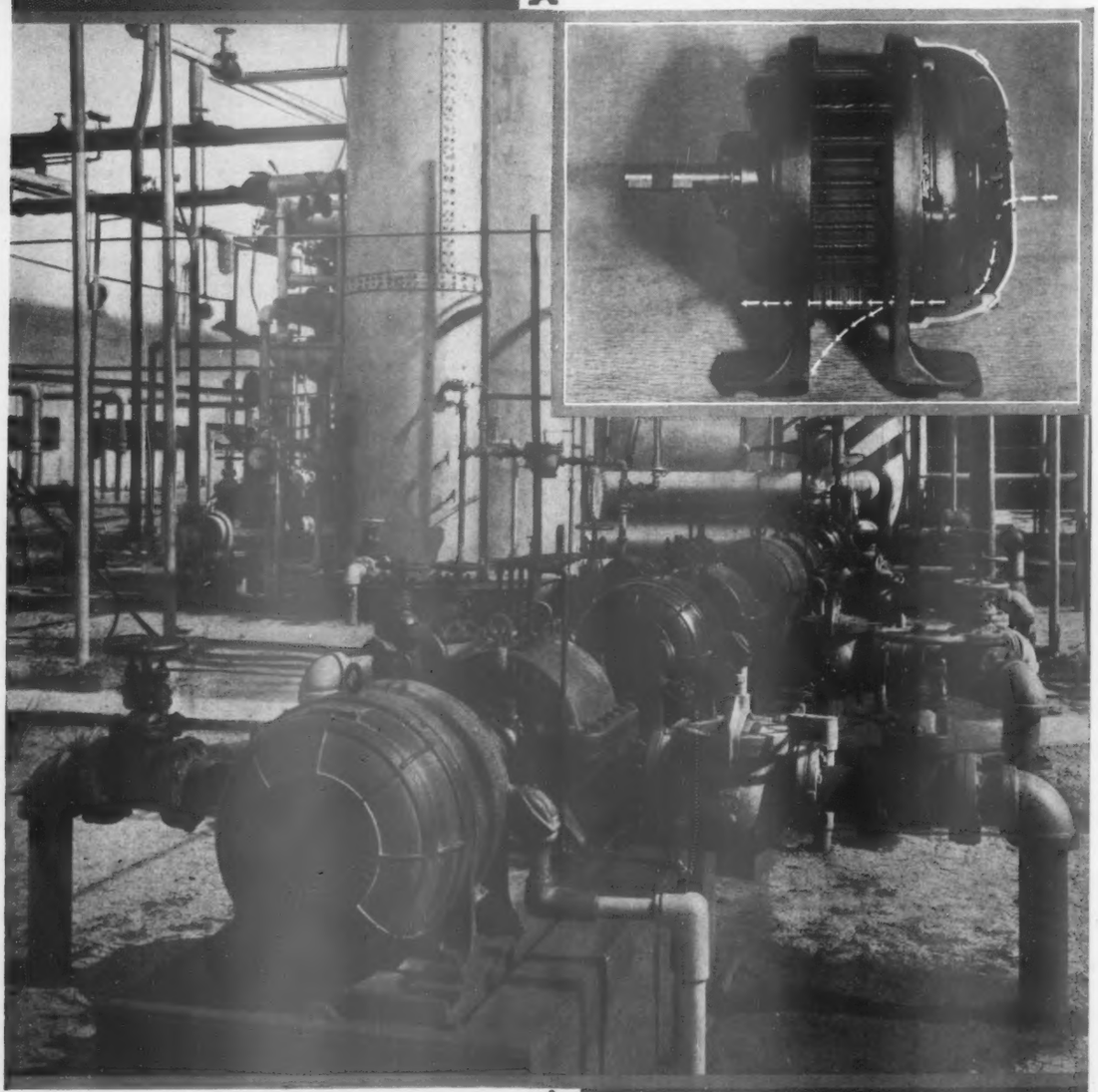
TAMPA

Weather-proof Motors

Wagner air-jacketed Motors are dust-proof and weather-proof yet thoroughly ventilated. They are totally enclosed and completely sealed against dust, gases, fumes, steam and moisture. An externally-mounted blower jackets the motor with continuously moving air and keeps it cool. These motors are operating outdoors and indoors, in the field, in refineries, on pipe lines, in gasoline plants.



Wagner builds every commercial type of motor and can recommend without prejudice the proper motor for the job.

Literature on Request

WAGNER ELECTRIC CORPORATION
6400 Plymouth Avenue, St. Louis, U. S. A.

Wagner Sales Offices & Service Stations in 25 Principal Cities

Products: FANS . . . . . Desk, Wall and Ceiling
TRANSFORMERS . . . Power, Distribution and Instrument
MOTORS . . . Single-phase, Polyphase and Direct Current

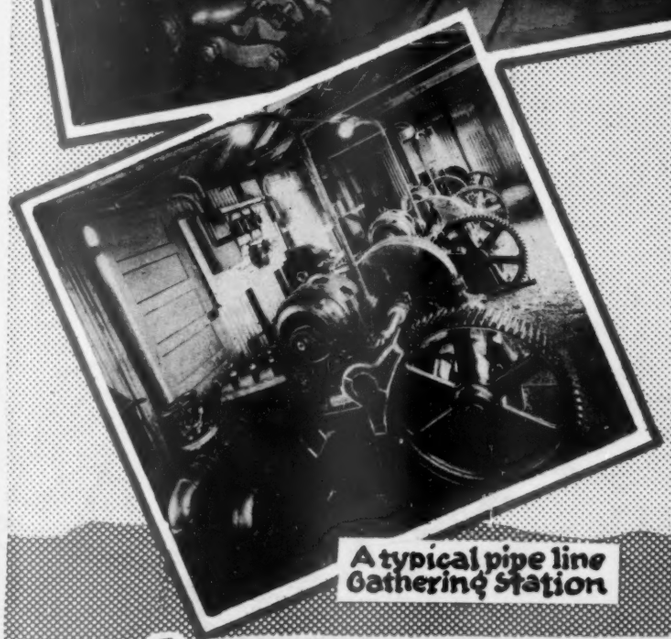
Wagner ...quality

61-7631-13

SERVING WEST TEXAS

31 Pumping Stations of Pipe Line Companies in Our Territory Are Operated by electric power

A typical pipe line Pumping Station



A typical pipe line Gathering Station

ELECTRIC PUMPING EQUIPMENT enables operators to buy their power at a FIXED charge.

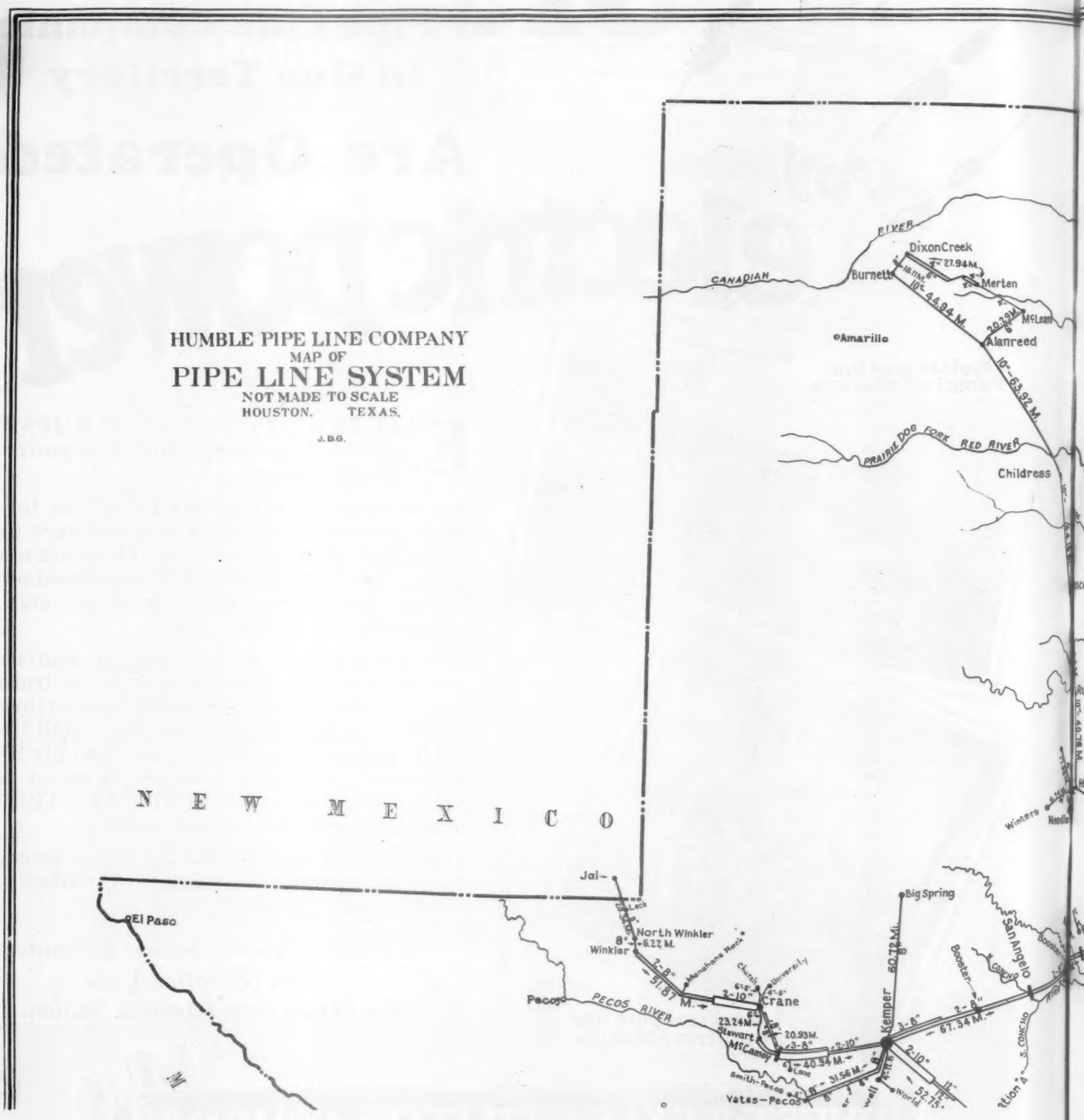
For example: Varying market prices for fuel oil or gas makes that kind of power very uncertain in cost from year to year. The price may be favorable when equipment is purchased and installed—but the next year's contract rates may be entirely out of line.

Executives who route their pipelines conveniently near the more than 2,000 miles of transmission lines which this company maintains throughout 45 West Texas Counties—and install ELECTRIC pumping equipment—are not only SURE of a steady, dependable supply of power under all conditions, but are SAFELY PROTECTED from any increase in power costs.

The rates for ELECTRICITY are constantly becoming cheaper—regardless of market prices of other fuel commodities.

Let Our Engineers Submit Estimates of the Operating Costs for YOUR Next Pumping Station.

WEST TEXAS UTILITIES COMPANY
In the Land of Opportunity
General Offices Abilene, Texas



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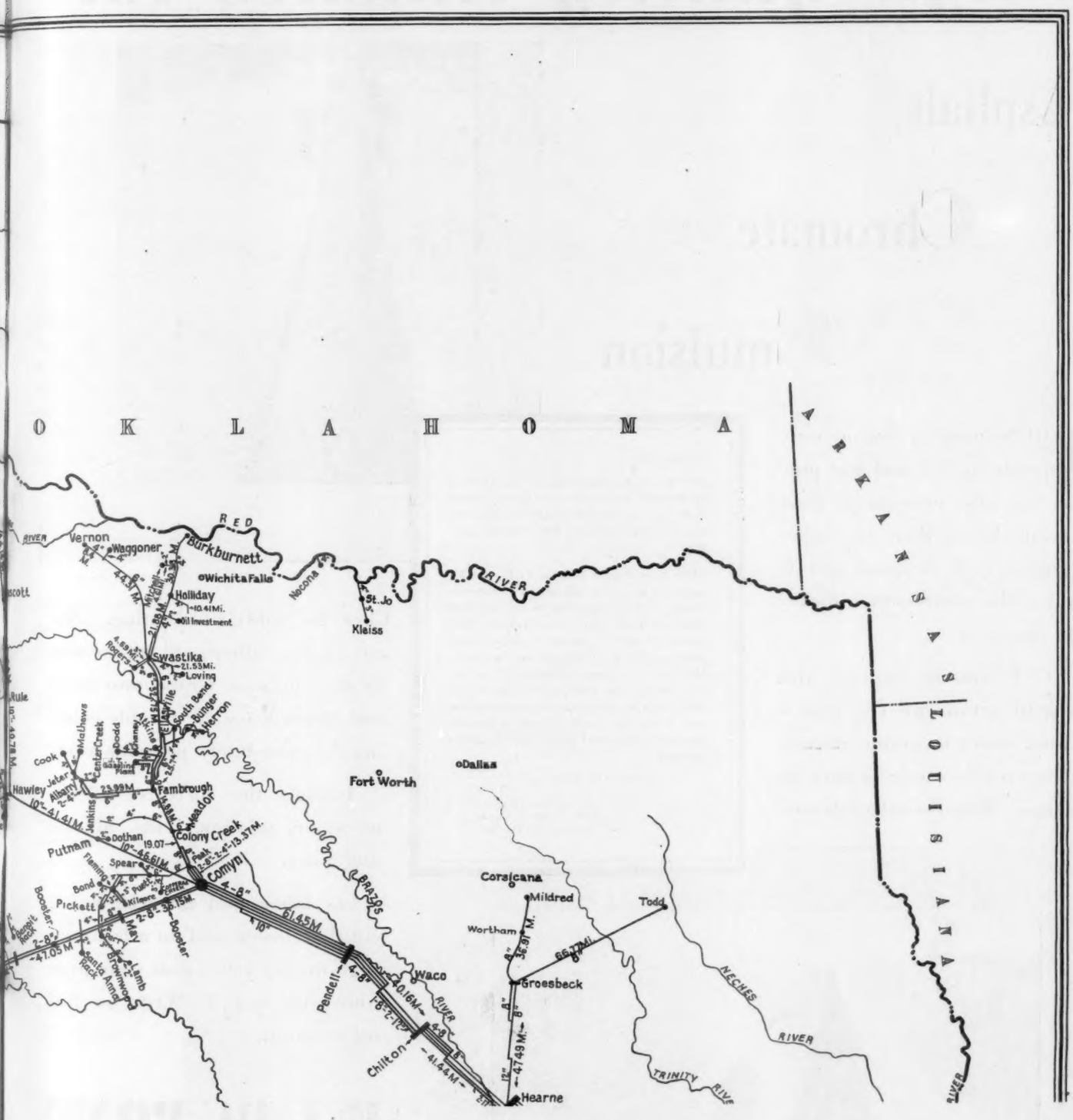

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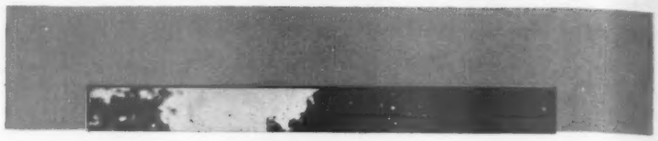
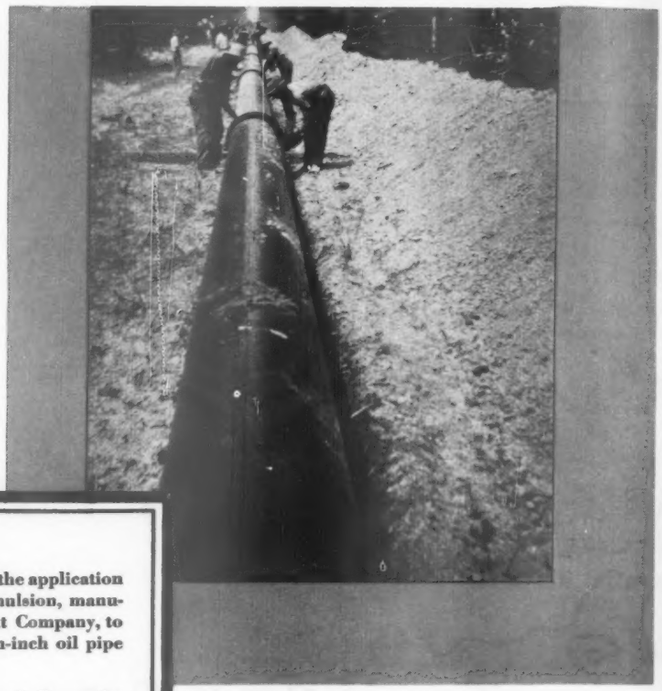


High-quality finishes for

Asphalt

Chromate

Emulsion



HERE'S a coating that not only speeds up oil and gas pipe laying but also protects it from corrosion, better than any other coating—A. C. E. designed specifically for the petroleum industry by du Pont.

A. C. E. can be applied with canvas to a mile of 18" pipe a day and, under favorable circumstances, even two miles a day. No hold ups. Beats penalty clauses.

Gentlemen:

We are just completing the application of Asphalt Chromate Emulsion, manufactured by the Du Pont Company, to one hundred miles of ten-inch oil pipe line.

We have found that A. C. E. can be applied at a rate of speed commensurate with the progress made in other parts of pipe line construction. The paint when dry forms a satisfactory coating which is impervious to water, and which clings tenaciously to the pipe steel. The coating surrounds the steel with a covering of pure asphalt, and we believe will provide adequate protection for steel pipes buried in the ground.

Yours very truly,

SHELL PIPE LINE CORPORATION
By R. P. Bascom (signed)
Vice Pres. & Genl. Mgr.

Goes on cold: no heating. No cut backs. Adheres to either wet or dry surfaces. Grabs onto iron and forms a tough, durable coating that absolutely prevents rust.

Inhibits the corrosive effects of water, sulphur, acids, alkalis and gases.

Cut labor and material costs, cut time losses, and do a lastingly high-quality job — coat your pipe lines with A. C. E. Write for full information.

E. I. DU PONT

Petroleum

Chicago, Ill.

the petroleum industry

PETRO PAINTS, ALUMINUM FINISHES, AND PRIMERS

Petro Paint developed especially for the oil and gas industries. Highly resistant to sulphur fumes and extremes of weather.

Developed especially for the petroleum industry, Petro Paint overcomes common difficulties in plant maintenance. It is remarkably resistant to destructive agents. It preserves and beautifies plant structures for long periods of time, with a minimum of repainting. And it is equally adapted to use on wood and in systems applicable to metal, plaster, concrete or any other type of surface.

Petro Paint sets a completely new standard for effective colors, efficiency and economy.

7 reasons why Petro Paint will meet your requirements

Consider these characteristics of Petro Paint as applied to your own specific painting problems:

1. Petro Paint is highly resistant to sulphur fumes and aqueous vapors.

2. It is adapted for systems designed for all types of surfaces.

3. On tanks it curtails evaporation. It has the remarkable quality of retaining its original brilliance and cleanliness for a long period of time without fading.

4. It has greater durability under any conditions.

5. It leaves a good surface for repainting.

6. It can be applied under adverse temperature conditions. It does not crawl on cold surfaces.

7. It hides better than other mixed paints—is very economical.

du Pont Primers for every requirement of the petroleum industry

However varied the problem, there is a du Pont primer ready—extremes of contraction and expansion, rust, corrosion, gas, acids, and alkalis, or electrolytic action. Du Pont chemists, with the assistance of maintenance engineers, superintendents and master painters of the petroleum industry, worked out four primers to meet all possible conditions—No. 45 Kromate Metal Primer for surfaces subject to continuous or intermittent contact with water; No. 44 Aluminum Paint Primer for structural steel and tankage; No. 7 Primer, a general purpose primer; and No. 41 Black Metal Primer for priming tank cars which are to be finished in high-gloss black.

All of these primers have the common characteristic of inhibiting rust, resisting all forms of corrosion, and meeting extremes of expansion and contraction. They hug the surface and form a tough, elastic bond between the finishing coats and the surface. They set up free from dust in four to six hours and dry hard in 24 to 36 hours. Therefore, they are unaffected by dew and moisture condensation. Maximum spreading capacity and may be either brushed or sprayed.

Aluminum paint for the petroleum industry

Du Pont engineers studied the common faults of aluminum paints in the petroleum industry and then evolved a line of aluminum finishes far superior to anything on the market. By perfecting a superior vehicle and pigment, these aluminum paints (1) keep their brilliance many times longer; (2) are easy to apply (even on vertical surfaces do not run or sag); (3) leaf properly; (4) are highly resistant to gas and moisture; and (5) set up in 4 to 6 hours and dry hard in 18 to 24 hours.

Comes either ready-mixed or ready to mix. The ready-mixed does not show discoloration or loss of brilliance from standing and maintains 100% leafing efficiency. The ready to mix is very easy to handle because vehicle and pigment have a natural affinity for each other. Both varieties of du Pont aluminum paints are extraordinarily durable and leave a good surface for repainting on final disintegration.

Call in the du Pont engineers to study your particular problems

These men have spent years in studying protective painting for the petroleum industry. Use their knowledge for the solution of your problems. At the same time send for technical bulletins which describe these and other du Pont products specifically designed to cover all the painting requirements of all divisions of the petroleum industry.

DU PONT

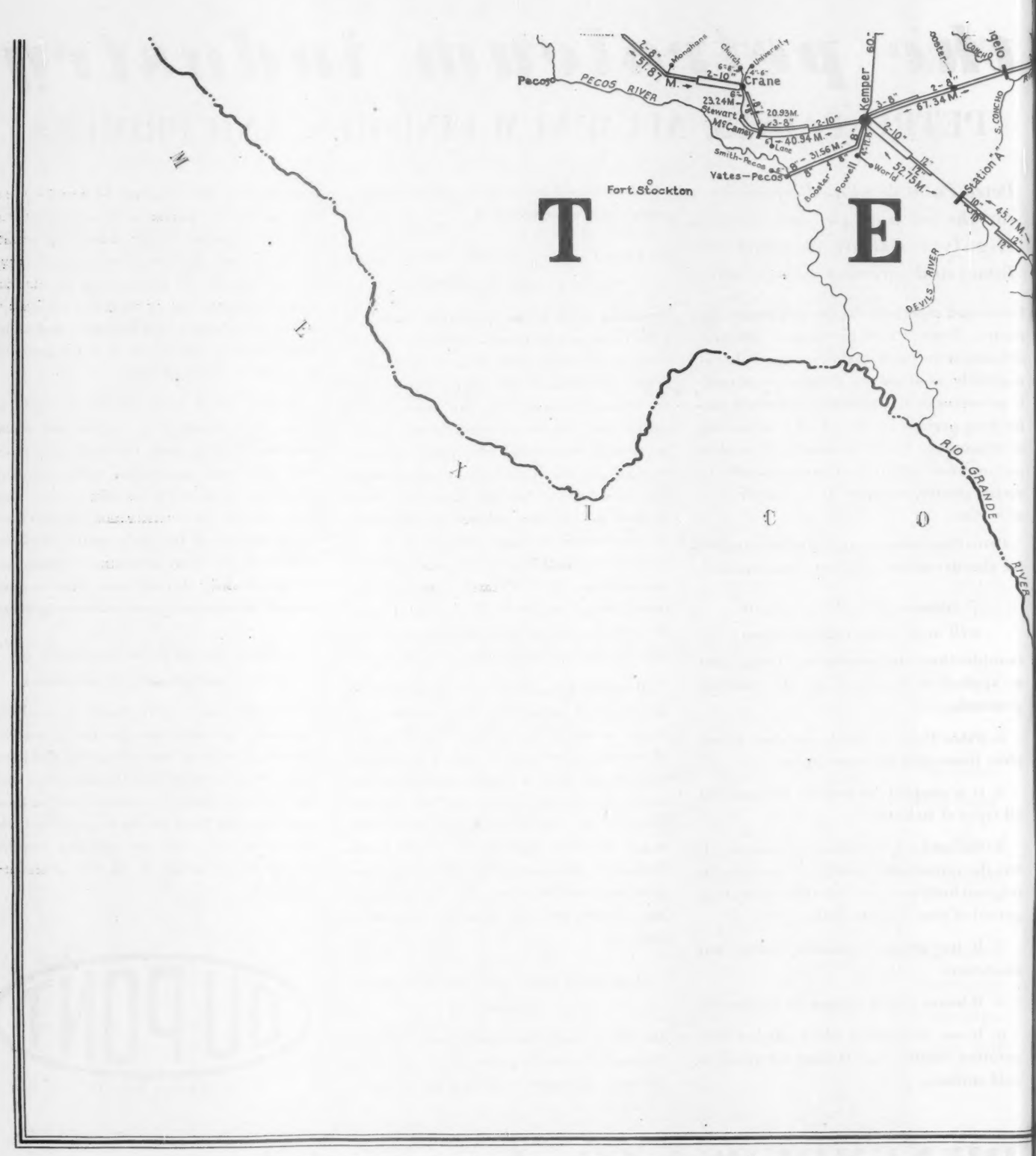
REG. U.S. PAT. OFF.

DE NEMOURS & CO., *Incorporated*

Sales Department

PUBLIC LEDGER BUILDING PHILADELPHIA, PA.

San Francisco, Cal.



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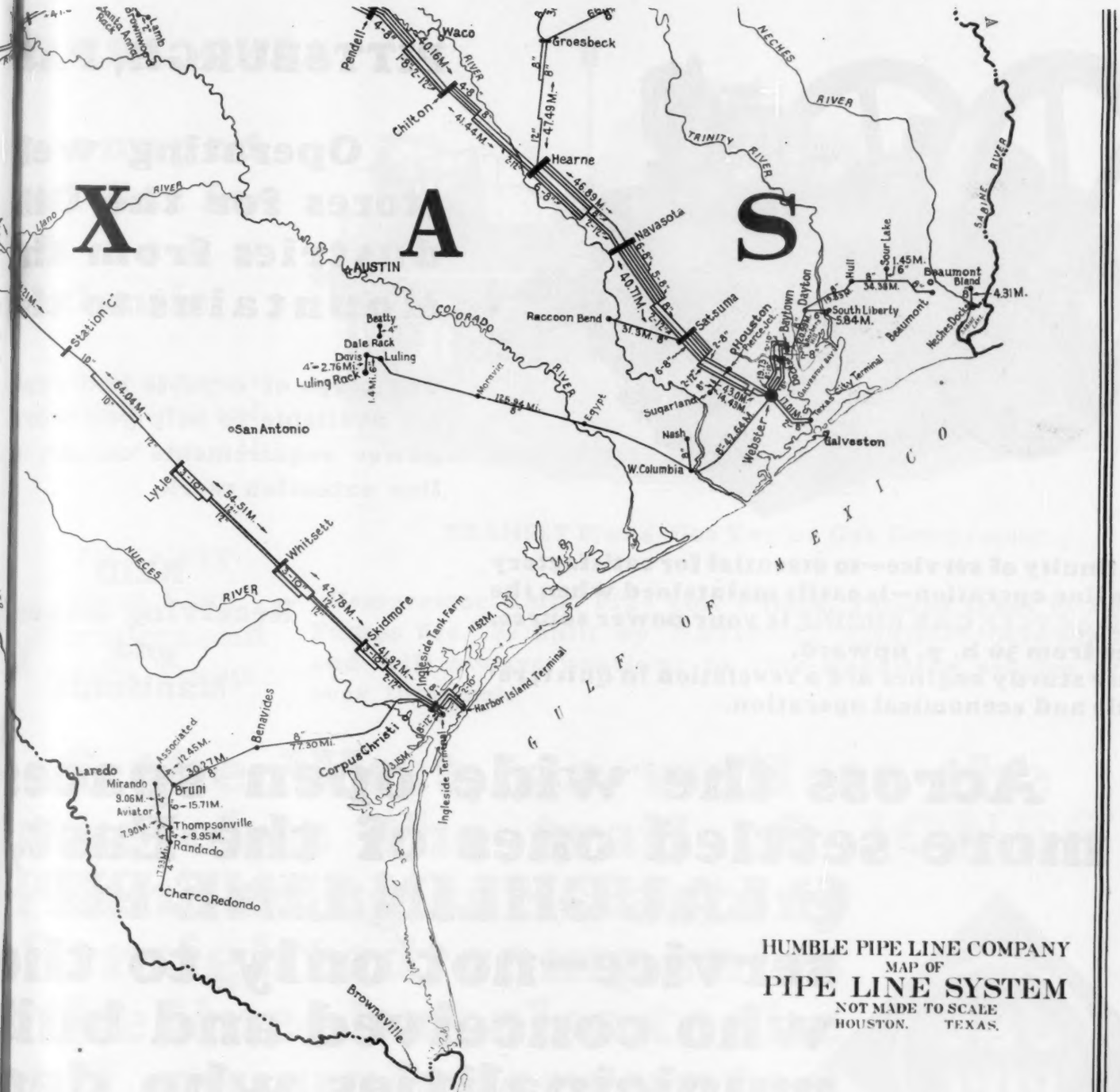

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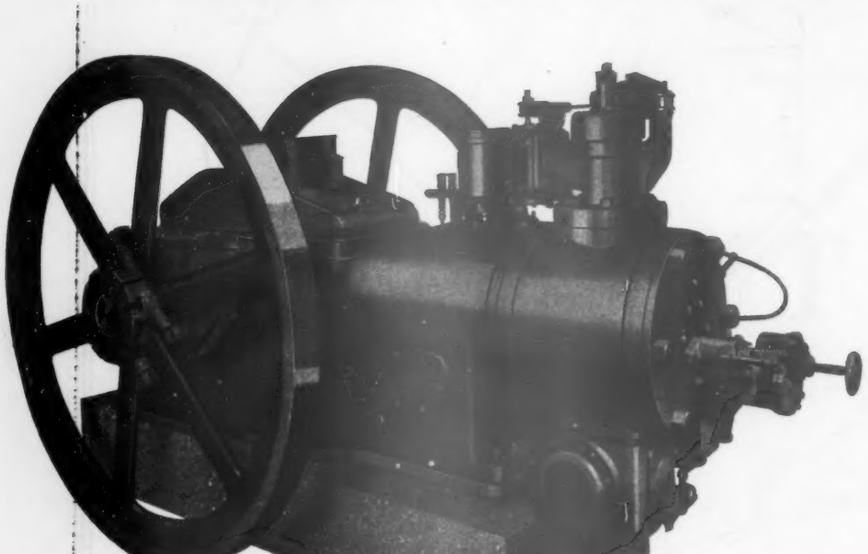
FRICK-REID SUPPL



Continuity of service—so essential for satisfactory pipe line operation—is easily maintained when the REID 4 CYCLE GAS ENGINE is your power source. Sizes from 30 h. p. upward. These sturdy engines are a revelation in quiet, reliable and economical operation.

PITTSBURGH, PA

Operating we stores for the Oi dustries from th Mountains to th

Our corps of capable and exp are available to help you wo power requirements on any line extension work.

REID Receiving Boxe and Manifolds

Across the wide open space more settled ones of the East

& LAUGHLIN LINE PIP service—not only to th who conceived and bui municipalities who de service for their indus

J&L PIPE

SPECIFY J & L TUBULAR GOODS

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PY CORPORATION

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Oi nd Gas In-
th Rocky
th Atlantic.

exp nced engineers
wor ut pumping and
any e of gas or oil

TRANSIT 17x24" Gas Engine Gas Compressor

TRANSIT
Pipe Line
Scrapers and
Klein Tongs

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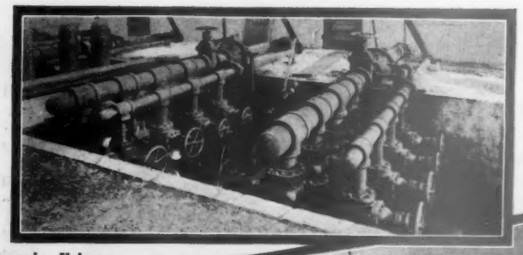


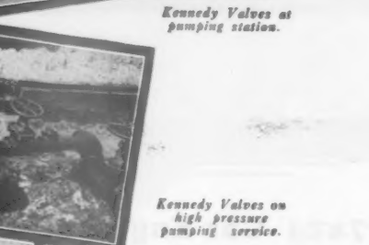
Kennedy Valves at manifold of tank farm.

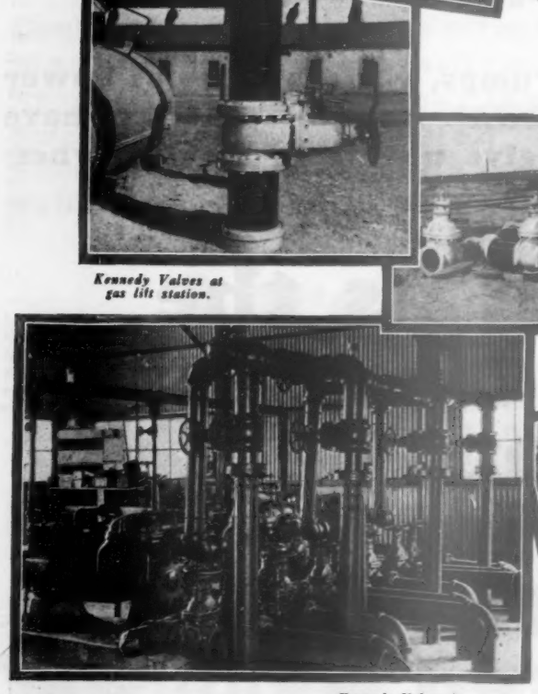
Kennedy Valves at pumping station.

Kennedy Valves on high pressure pumping service.

Kennedy Valves at gas lift station.

Kennedy Valves on gas stripper.





Kennedy Valves in compressor room.

Kennedy Valves on manifold at loading dock.

Kennedy Valves on manifold of cooling coils.

NOTE the wide variety of pipe line, power plant and field requirements served by the Kennedy Valves shown in the accompanying illustrations.

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Natural Gas for Southeastern States

Definite Step in Progress That Section United States Promised as Result Construction of Line From Louisiana

By J. E. Judson
Vice President, Ford, Bacon & Davis, Inc.

Whatever has been done is a fact and forms the basis for prediction of what will be done. So, based upon past history of pipe line construction, there is ample justification for the promise of natural gas in Birmingham, Ala., and Atlanta, Ga., by Christmas. Up to the present time, natural gas has not been available to the southern tier of states east of the Mississippi River and this advent into the communities of Mississippi, Alabama and Georgia marks a definite step in the economic progress of these states.

The gas will come from Monroe and Richland Fields in Louisiana and will be carried by a main trunk pipe line which will extend from Pioneer Junction in Louisiana where the gas from the two fields is delivered to the main 22-inch line. From Pioneer Junction, the line will extend to a point south of Lake Providence to a header which will split the main into two 16-inch lines with provision made for a third 16-inch line when necessary. On the west bank of the Mississippi River, each 16-inch line will be split into three 10¾-inch lines, making a crossing of the river of six 10¾-inch lines which will be gathered on the east bank into a single 22-inch line which will continue to Birmingham, except in instances where other river crossings make provisions for special treatment necessary. From Birmingham, the line will continue at 20 inches to Atlanta. From the fields to the City Gate at Atlanta, is a little over 450 miles. The present program contemplates 19 branches from the main line to supply gas to communities within economic reach.

More Than 900 Miles

And so this is the outline picture of a project conceived by the Southern Natural Gas Corp., involving in main line and branches, a total of more than 900 miles of pipe line, without doubt the largest pipe line conceived and under construction today. Undertakings of this character could not be visualized a few years ago but today are taken for granted if accomplishment be entrusted to those who have pioneered in this particular field of operation.

This line running from east to west, crosses the water shed of several important rivers. It crosses country not only historically notable but country which has created some of our gravest flood problems, especially in recent years. Traversing the Mississippi water shed in the delta region, the line crosses in Louisiana, the Boeuff, the Macon, the Sunflower and the Alligator Rivers before reaching the Mississippi. Then, as the state of Mississippi is entered, such well known troublesome and turbulent rivers as the Yazoo, the Big Black, the Noxubee and the Tom Bigbee are crossed and continuing through Alabama and Georgia, the Sipsey, the North, the Warrior, the Cahaba, the Coosa, the Talapoosa and the Chattahoochee, names which in themselves would be formidable even were the bad reputations of the rivers themselves not so well known.

Each river crossing presents its own problem and each problem demands a solution of the method to be employed in the construction of a crossing which will best serve the purpose in ultimately creating its part of the whole line with no question as to its permanence under the strains of flood water. A total of 17 principal river crossings are provided for in the general program of construction.

The river crossings present but one of the problems of major importance in the construction of this line. The passing of the line through the heavy alluvial soils of the bottom lands in the delta country created a problem in itself. The location of the line through the uplands and higher regions of Alabama where much difficult construction on account of rolling country and rock formations was encountered, required careful consideration.

For the immediate requirements of the line, two compressor stations are planned; the first of 3,750 horsepower capacity will be located at Perryville in Louisiana and the second of 5,000 horsepower capacity will be located at Reform in Pickens County, Ala., approximately 60 miles west of the City Gate at Birmingham.

Bridge over swamp in Delta country.

Subcontracts for the compressor stations have been let to A. M. Lockett & Co. of New Orleans. The compressor stations will be equipped throughout by the Worthington Pump & Machinery Corp.

Engineering Design

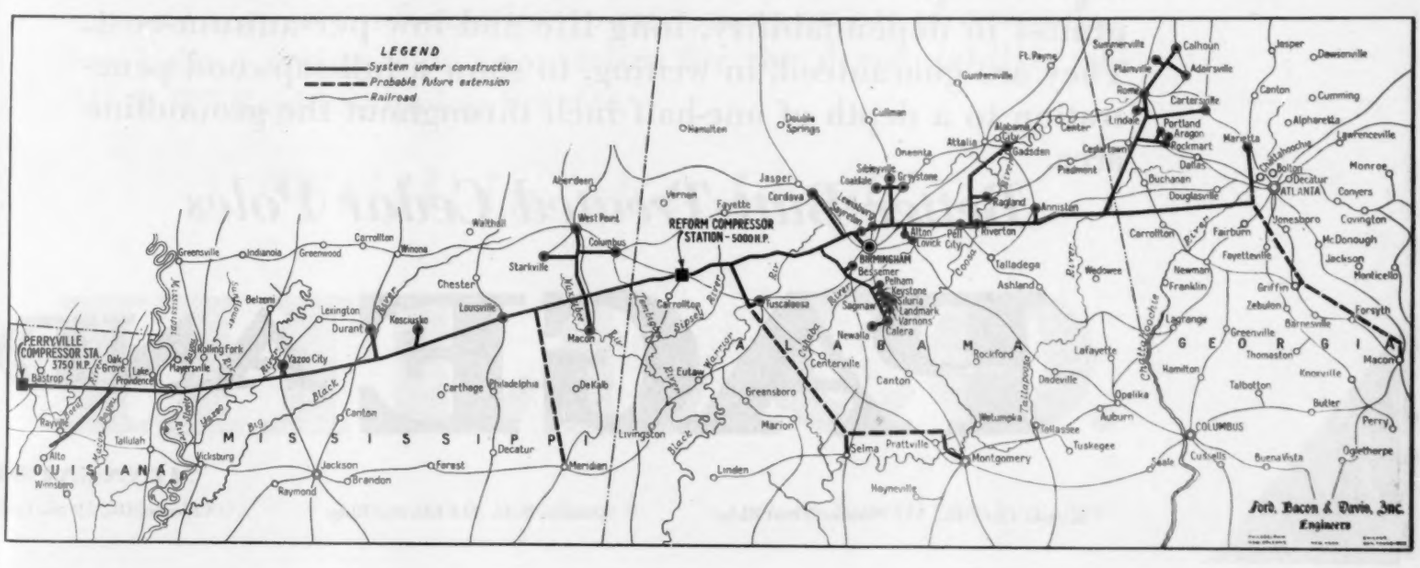
Except at river crossings, the main line will be plain end, steel pipe, in random lengths from 20 to 40 feet, coupled with Dresser couplings, using rubber gaskets. At river crossings, such type of construction will be employed as seems to best fit the conditions to be met. Usually multiple lines will be constructed as a protection against interruptions in service. All crossings will be bowed upstream between headers located above normal high water to offer the greatest possible resistance to displacement by flood. Specially designed clamps from three-quarters of a ton to a ton in weight will be applied over the couplings and there will be collar leak clamps for extra precaution.

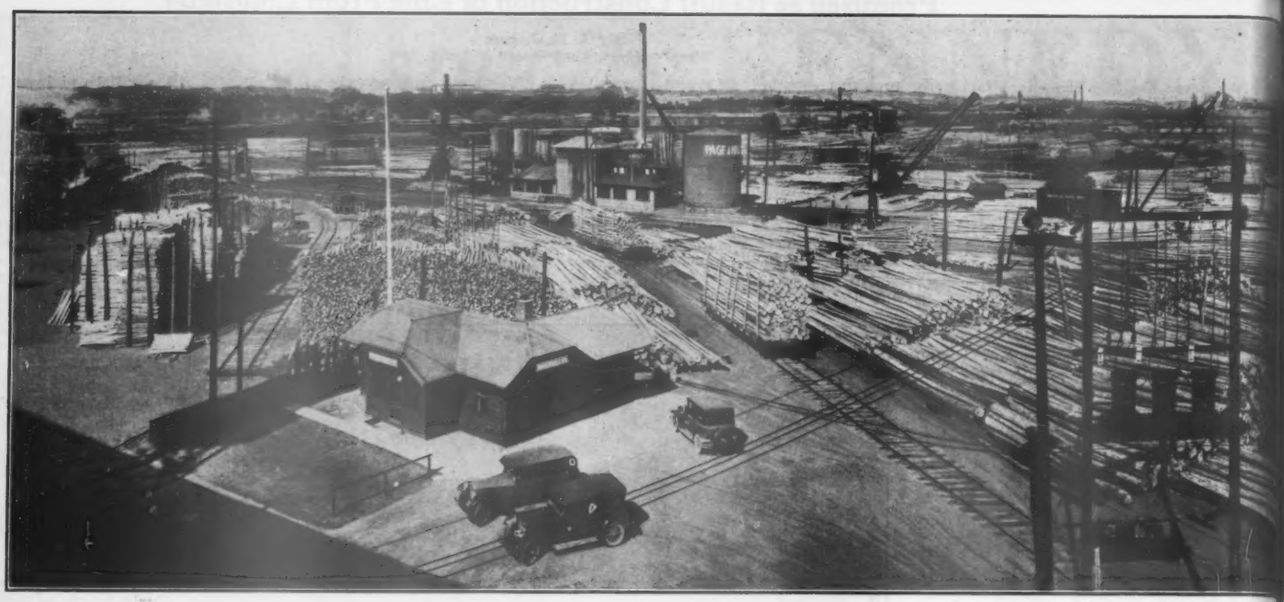
Due to the high pressure at which the line will be operated, a minimum depth of cover of 30 inches will be maintained throughout the line. This minimum will be held through rock sections, stream beds and slopes as well as through the rolling country which represents the greater part of the distance. The ditch depth will be from 50 to 60 inches. Line angles and vertical angles in excess of 2 degrees will not be permitted. Where sharper turns than are possible within a single length of pipe and the 2 degree limitation, are necessary, special provision will be made either by a cut joint or by the use of fire bends made in the field and slowly cooled. For all special crossings, special designs of couplings are provided.

Many watercourses, although normally sluggish, are at times subject to flood conditions and it, therefore, will be necessary to take precautions to prevent movement of the pipe. Due to the action of the acid and alkali soils upon concrete masses which are usually used for anchors, it has been decided to use only heavy iron castings, specially designed and machined to fit over couplings. These couplings are further supplemented by coverings of heavy rock masses where rock is available.

Corrosion Problems

Until the construction of the Denver-Amarillo line last year (1928) there has never been made any co-ordinated and definite effort to determine the effect of soil conditions upon the durability of pipe. It had, therefore, been the custom to protect pipe against corrosion with little knowledge as to the relative corrosive effect of different soils along the line. The result was that more expensive





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coverings were used at many places than were necessary and at other places less elaborate precautions were taken where larger expenditures would have been justified. In this line, soil analyses have been made at frequent intervals along the right-of-way and where topographical conditions indicated, the samples of soil were taken at very close intervals due to the effect of topography upon the nature of soil under varying conditions. Samples of soil were drawn with a 2-inch soil auger extending to a depth of from 4 to 5 feet. Analyses of soil samples and of the water extracts having been made, the conditions which might influence the conclusion from the analyses were studied, such as slope, direction of exposure, surface moisture, evidences of watercourses, lake beds, type of vegetation, normal surface use of ground and nature of soil and wherever possible, probable duration of continuance of present uses. Interpretations of the analytical and topographical data so obtained, enabled the engineers and chemists to rate comparatively the corrosive effect on all sections of the line.

Coosa River at line crossing.

All matters pertaining to pipe protection were handled by J. W. Richards & Son, chemists and assayists of Denver, Colo., in co-operation with the chemical engineers of Ford, Bacon & Davis, Inc.

As reference to the map will show, the line traverses country which is not characterized by marked variations in elevation, such as made the Denver line most interesting from the standpoint of the construction engineer. From the level of the gas fields, the line extends easterly from Monroe some 30 miles and northeasterly from Richland some 20 miles to the point of junction at Pioneer. Here the line enters the delta country and may be said to remain within this region until after it passes Yazoo City in Mississippi. This territory is subject to annual flood and construction work within its limits depends upon the subsidence of the flood waters. At the moment of writing, the waters generally have receded to an extent which warrants the construction crews in commencement of work within this section.

East of Yazoo City, the line crosses characteristic southern country throughout the State of Mississippi and the westerly limits of Alabama to a point north of Tuscaloosa where it approaches the industrial section of Alabama in the vicinity of Birmingham. From this point eastward to Atlanta the line, excepting in the river valleys, continues through interesting rolling country. The main line, in its 450-mile traverse, crosses railroad rights of way at approximately 20 points and there are a number of crossings of arterial highways.

Vast Quantity of Material

It is approximately estimated that for the main line and branches upwards of 5,000 carloads of material will be required. The material is shipped in all cases to the most convenient railway siding where it is unloaded for distribution. It does not always occur that the nearest point to the line is the most convenient unloading point, for careful study is required to determine the best route for trucking from the unloading point to the line. Frequently roundabout roads must be taken to reach points which, with less bulk, could be reached more directly.

Practically all material, with the exception of pipe, will be unloaded by hand at the receiving points where temporary store yards are being created.

The pipe is unloaded by gin poles or "A" frames and block and tackle, the motive power being trucks. A gang of seven men with a gin pole and a 2-ton truck can unload approximately ten cars of pipe per day.

Typical rolling country in Alabama. Note rain erosion.

Material of all kinds is distributed as required by trucks. Trailers are made use of in stringing the pipe and a usual load of pipe consists of seven lengths from 5 to 6 tons. Two considerations are given to truck equipment; they must be equipped with oversized pneumatic tires to avoid damage to road surfaces, and also to permit maximum safe speed on the highways and at the same time to enable the trucks to safely traverse the undeveloped roadways along the rights of way.

Wherever possible all work is done mechanically. The use of trucks to unload and string materials is the beginning of the mechanical operation. For practically the whole length of the line ditching machines will be used. In open country these machines, working 24 hours a day, will readily cut a mile of ditch, 5 feet deep and 26 inches wide. The line will be coupled or welded on the surface, carried on skids for varying distances before dropping into the trench.

The ditching gang will be followed by the lowering gang which lowers the pipe into position ready for backfilling the trench as the work proceeds.

In advance of the pipe laying gang, the application of pipe protective coating is made. Where only cold coating is required, it is applied by roofing brushes or by the canvas sling method. Hot coatings are applied by either hand operated or motor driven rolling rigs and wherever possible this method is employed because of the greater economy, not only in application but in the saving of materials and more even spreading of the coating.

As is customary in work of this character, local labor and supplies are being utilized wherever possible. A skeleton organization, usually consisting of foreman, subforeman and pipe stabbers, is supplied from the experienced crews and local labor is used to every extent possible.

At the writing of this description, which is during the early stages of construction and approximately 30 days in advance of its publication, construction of the main line is going forward in 20 different locations and more openings will be made as promptly as construction material can be distributed along the right of way. At the peak of construction activities it is expected that not less than 4,000 laborers will be employed.

Pipe Laying

As before noted, crossings of each river will receive special treatment but, generally speaking, all lines will be constructed on the surface and placed in position at the bed of the rivers by hand methods.

In the open country, pipe cranes will be used for stabbing the pipe for joining and later for removing skids. As is customary, the pipe will be trenched by hand with the use of pipe horses. The main line pipe will be continuous from beginning to end of the line, with plugged fittings for branch lines. Gates in the line will be at convenient intervals approximating 10 miles apart and will not be placed until the pipe laying has been completed. This procedure permits of more rapid progress of the pipe laying gangs without interruption for setting the gates.

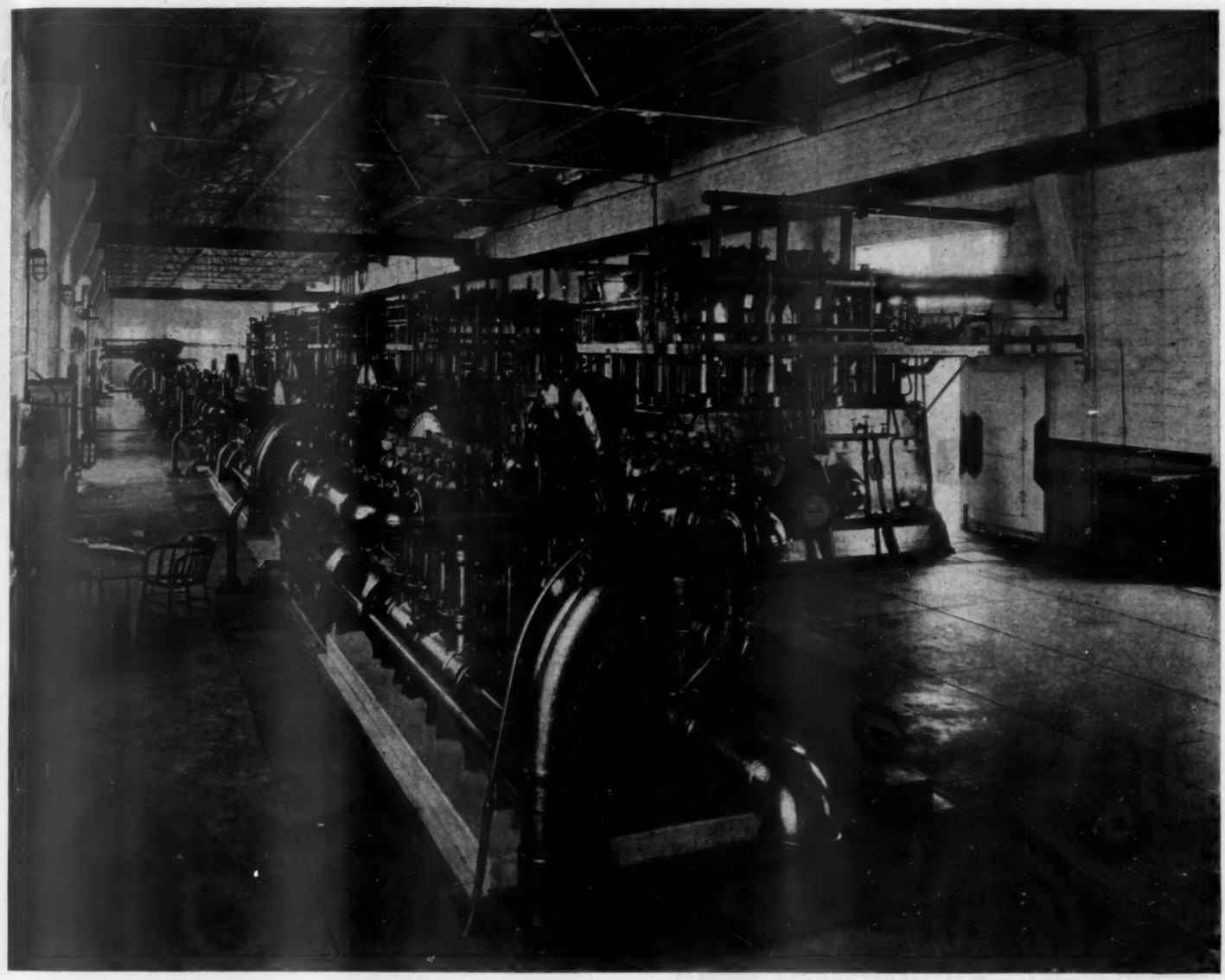
Typical eroded road ditch near Rome, Ga.

This method also makes it possible to utilize a more expensive gang continuously for this particular important phase of the work. Gates will be set successively starting at the west end of the line. Prior to the cutting of the line at any point for the installation of the gate, the preceding section will be packed with gas at the highest available rock pressure. After cutting the line, packed gas will be used to blow out the next section before setting the gate valve. This method prevents damage to gates and valve seats during the process of removing dirt and various foreign substances from the line and serves as a preliminary test of the tightness of the line.

Branch Lines

The construction of branch lines is not the work of the moment and, therefore, a complete and definite statement of the complete territory to be served is not possible but there are now under construction in Mississippi, a northerly branch from the main line to serve Yazoo City, another to serve Durant and a third for Kosciusko. In the northerly section of Noxubee County, there is a north branch extending to West Point in Clay County with a westerly lateral extending to Starksville in Oktibbeha County and an easterly lateral extending to Columbus in Lowndes County. There is also a southerly branch extending to Macon. There is also a projected branch extending southerly to Meridian. In Alabama, there is a

Chattahoochee River near line crossing.



A cleaner, neater, more economical and dependable pipe line pumping station would be hard to find

THE above five 3-cylinder 300-b.hp. McIntosh & Seymour Diesel Engines driving hydraulic pipe line pumps are installed in a Texas station of one of the most prominent pipe line operating companies.

The first installation of these units consisted of three sets. Several years later three more sets were added.

Some of the McIntosh & Seymour Engines were once operated continuously at full capacity 24 hrs. per day for 95 days in succession, and at the end of that operating period were shut down only because the pumping demand had decreased. On inspection after the long run, the working parts were found to be in prime condition and showed no evidence of fatigue. Throughout the run, the fuel economy kept right up to the well-known McIntosh & Seymour Standard.

At the present reduced rate of production, the flow at this plant can easily be maintained by five pumping units, so the sixth McIntosh & Seymour Engine and the pump it drives were recently removed and have been set up in another station.

The owners of this station have purchased 24 McIntosh & Seymour Engines since August, 1919, and another large pipe line operating company to whom we shipped its first in June, 1916, has now purchased 51 McIntosh & Seymour units.

High fuel economy, dependability for long runs under heavy loads, perfect adaptation to pump speed, and ease in disassembling and moving to new locations, make good Diesel engines ideal for pipe line service. Units of which we know have been shipped about from one station to another as the oil production shifted, and in all instances, the service economy is as good on the new as on the old foundations.

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southerly branch to Tuscaloosa and another to Calera with a westerly lateral to serve Newalla and an easterly lateral for the Bessemer district. A northerly branch will extend from a point just west of the Birmingham gate to Cordova. Similarly, short branches will serve the towns of Sayreton and Lewisburg and another branch will extend to Coaldale, Sibleyville and Graystone. Just east of Birmingham, a southerly branch will extend as far as Lovick and another one to Pell City. The northern branch will extend to Gadsden and a lateral will reach Ragland. Anniston will be served by a branch leaving the main line just west of Choccolocco. Although not in the immediate program but under consideration, is a branch extending the Tuscaloosa line to Montgomery, serving Selma by a lateral. As the main line enters Georgia, a northerly branch will be built under the present program as far north as Calhoun, passing through Rome. Laterals from this branch will serve Cedartown, Rockmart, Portland, Cartersville, Lindale, Plainville and Adairsville. The terminus of the main line will be at the Atlantic City gate but leaving the line and extending north at this point a branch will serve Chattahoochee, Bolton and Marietta. The line is projected southerly from Atlanta to Macon but this branch is not included in the present program.

This line is being constructed for the Southern Natural Gas Corp. by Ford, Bacon & Davis, Inc., of New York, Philadelphia, Chicago, New Orleans, and San Francisco. The offices of the Southern Natural Gas Corp. are in Birmingham, Ala., in the Watts Building and for the purpose of the work, as agent of the corporation, Ford, Bacon & Davis, Inc., has made principal construction headquarters at the same location with such branch offices on the line as necessity and convenience suggested. Contracts call for the delivery of gas by December 31 of this year and progress reports on the work today indicate that the work will be completed well within the time limit set.

The Southern Natural Gas Corp. is represented on the work by J. H. White, vice president, and by P. McDonald Biddison, consulting engineer.

Subcontracts covering ditching, painting, laying and backfilling of pipe have been let to Williams Brothers, Inc., of Tulsa, the Oklahoma Contracting Co. of Dallas, Tex., the Hope Engineering Co. of Mount Vernon, Ohio, and the Sheehan Pipe Line Contracting Co. of Oklahoma.

Pipe for the line is being furnished by the National Tube Co. of Pittsburgh, Pa., the Republic Iron & Steel Co. of Youngstown, Ohio, and by the A. O. Smith Corp. of Milwaukee, Wis. Pipe furnished by the two former mentioned companies is of the lap weld type and by the latter of the electrically welded type known in the trade as "Smith-welded."

All pipe from 10 inches up will be equipped with Dresser couplings manufactured by the R. S. Dresser Manufacturing Co. of Bradford, Pa.

For the purposes of the work the several subcontractors have established offices at convenient points along the line and warehouses, shops, garages, etc., at many points along their respective sections of the right of way.

Depending upon local labor, it is not at the moment expected that construction camps will be necessary. The plan of organization calls for daily reports from the several subcontractors which are forwarded to the Birmingham headquarters of the engineers. Combined progress reports of the work are maintained at the principal office so that the advance of the work may be continuously noted and the progress of the individual contractors co-ordinated so that the completion dates of all will be as nearly as possible coincident.

Upon completion of the construction of the line, the properties of the Southern Natural Gas Corp. will be managed and operated by Ford, Bacon & Davis, Inc.

Constructing West Texas Pipe Lines

Problems Met at No Other Place in United States Met by Companies and Solved by Their Engineers

Prepared by Representative of Humble Pipe Line Co.

The construction and operation of pipe lines in West Texas in many cases is attended by difficulties and problems not encountered in any other part of the State and in very few parts of the United States. Many who are not familiar with the West Texas territory probably have it pictured as a vast waste of sand and desert which in part, or it may be said in a greater part, is true. However, there is some extremely rugged mountain country in West Texas over which pipe lines have been built.

Erosion near Pickens, Miss.

These mountains at first glance to the uninitiated would present almost insurmountable obstructions over which to build pipe lines but the "pipe liner" with the present-day equipment knows no obstructions and permits nothing but a rancher with a shotgun or six-shooter to stop the line and the work. This latter barrier is left to the right of way man to remove.

It is true however, that rough and mountainous country presents real problems in getting pipe, material and other equipment hauled to apparently inaccessible points along the right of way and in many cases it has been necessary to haul both material and equipment some 35 miles to reach a point that can be easily seen from point of starting. This obviously causes high construction costs.

Air Compressor and Dynamite

Nature has favored the greater part of West Texas with a good foundation of rock which is encountered under a few inches of alkali soil or sand, and it is in these cases that the air compressor and dynamite play an important part in the construction of pipe lines. The rocky formation is not confined to mountainous country alone but being the rule rather than the exception in the plain or desert country of West Texas, the cost of this kind of ditching adds materially to the construction cost of any pipe line in this territory.

Not all of the pipe lines by any means cross the rough and rugged mountainous sections. Several of them lay straight across the deep sandy wastes and desert country, particularly those connecting the Crane and Winkler Fields, and in the construction of lines across this part of West Texas problems were met and solved not heretofore faced in pipe line construction.

This territory of shifting sands and alkali dust of varying depths is approximately 35 miles long, stretching from Crane County oil field to Monahans on the Texas & Pacific railroad, and through this desert waste there is no water in sufficient quantities, or of suitable character for even human consumption. In contemplating a line through this arid territory decision was made in favor of the all welded line, as it was felt that a good welded line would withstand, to a greater degree, the unstable conditions of the ditch, due to the shifting of sand, and obviously leaks and maintenance would be minimized.

Carried Water in Line

With such decision of the company building the line the construction forces were faced with the problem of scarcity of water, and it was up to the ingenuity of the man in charge to furnish water for the recharging of carbide generators, which require from one to two barrels of water per day, together with water for teams used in transporting generators, construction material and other equipment, and for camp purposes as well. It is interesting to note that this problem was solved by starting the line at a point where good water was obtainable and laying it one or two miles, then deadending or welding up, and placing valves near end of line for drawing off water. The line was then filled with water and held under pressure by small pumps operating at the station. This procedure was repeated every 1 or 2 miles until the entire line was constructed through this sandy country.

The water from the tap on main line was then distributed to the nearby welding gangs and construction camps with catapillar tractors which although slow were sure and obviously saved considerable time and expense over what it would have been had some other scheme similar to this not been adopted.

The water so supplied was, of course, unfit for drinking and cooking purposes, and it was, therefore, necessary to secure this water from the nearest point possible, to be hauled by truck to the farthest point in the sand possible for trucks and then relayed by teams to the camp and to the men working along the line.

Water Cost $8.50 per Barrel

In one case it has been reported that one "10-up" team was required in hauling the 12-bbl. water tank from relay camp to construction camp, and it has been estimated that water cost as high as $8.50 per barrel delivered to the camp.

Commissaries and other camp supplies were also delivered in practically the same manner as drinking water and it is needless to say that the unit cost per meal contributed quite a bit to the total high cost of construction of a line.

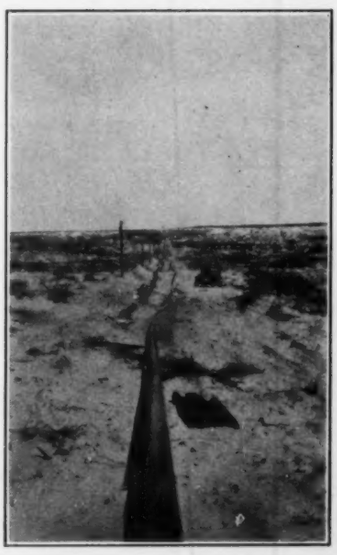
History repeats itself in high cost of transportation for pioneering and this was no exception. It is, therefore, obvious that unit cost of line under such conditions would be greatly in excess of line under average conditions when taking into consideration the fact that along the right of way of many miles of these lines it has been necessary to use one "6-up" team for three 20-foot joints of 10-inch line pipe. It was a common expression to hear someone say, "here comes the two miles of teams with one mile of pipe."

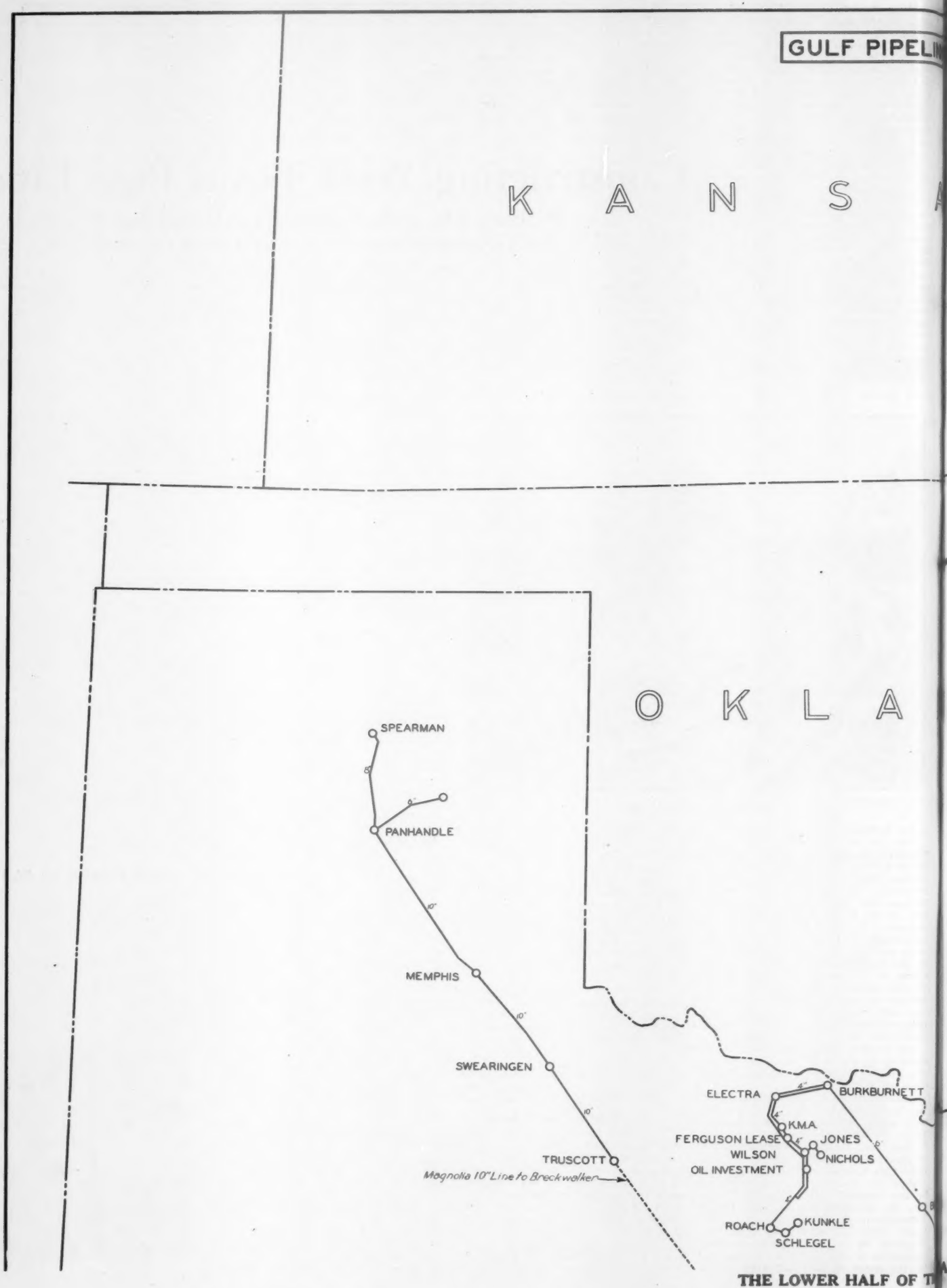
As it was impossible to run trucks over this territory all hauling done from the relay camp to construction camp and points along the line was done entirely by team, and one company reports as having had between 275 and 300 head of stock at one time, in order to properly handle material, equipment, etc.

Due to the deep sand and large sand dunes encountered between Crane and Winkler Counties it was generally found cheaper by companies constructing lines between these two fields to clear and prepare right of way by teams and fresnos than by the usual hand work, yet due to the extreme conditions under which they were working this proved a very costly item within itself in this territory.

In closing, it would not be justice unless mention was made of the engineering parties who first blazed the trail across this vast desert waste, picking out the most economical point, if such was to be found, as it was necessary for these men after reaching the farthest point with cars to start out in "6-up" teams transporting their equipment, commissary supplies, etc., to last two or three weeks, when it would ordinarily take only seven or eight days to run both transit and level lines.

PIPE LINING IN SAND





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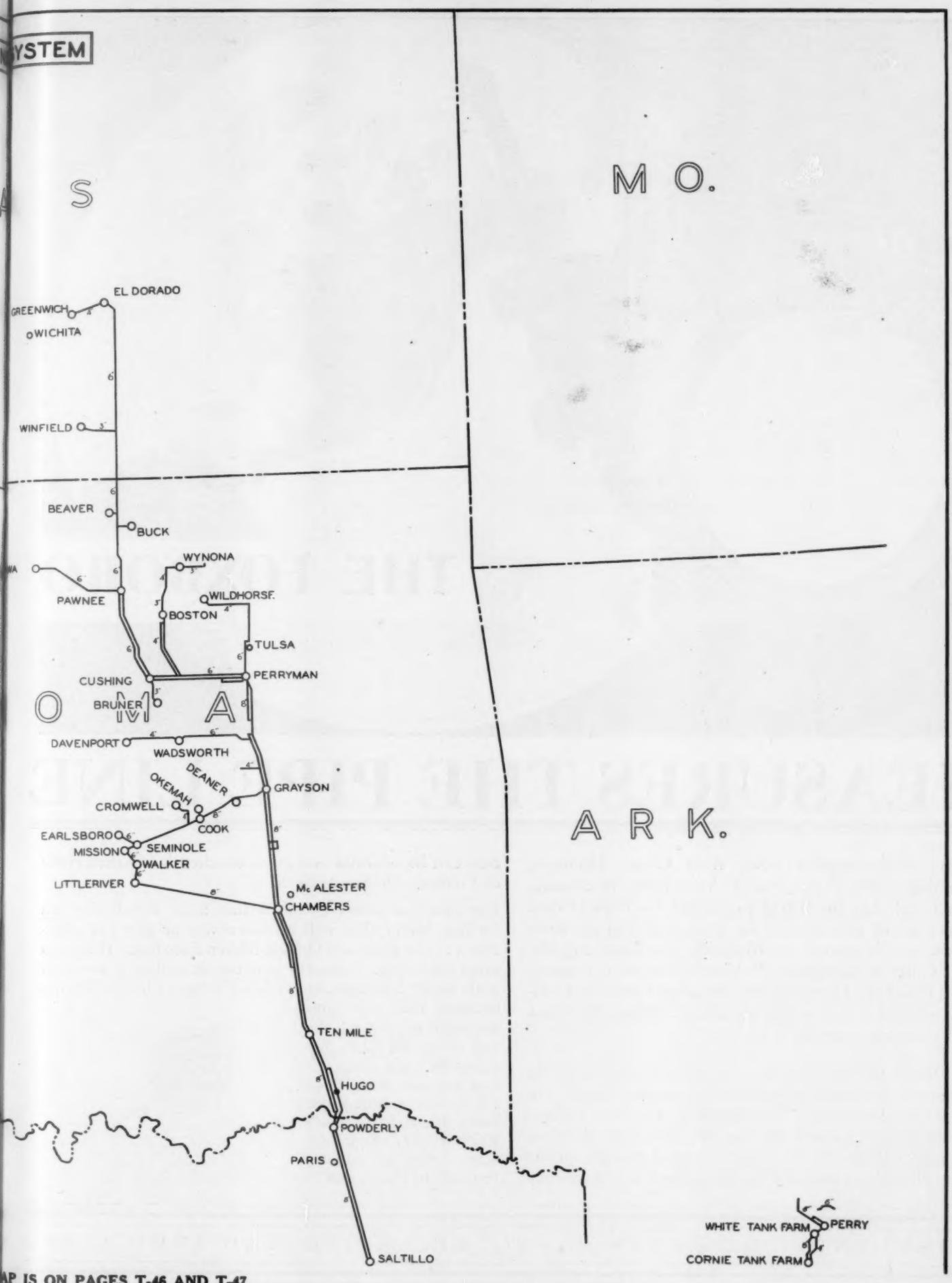

MAP IS ON PAGES T-46 AND T-47

MEASURES THE PIPE LINE

In the Mid-Continent field, West Coast, Montana, Wyoming, Ohio, Pennsylvania, Venezuela, Roumania, Russia—all over the world you'll find Foxboro Orifice Meters on the pipe lines of the largest oil and gas companies. In this country the Magnolia Gas Company, the Dixie Gulf Gas Company, Phillips Petroleum Company, Uinta Pipe Line Company, and Houston Gulf Gas Company are just a few of the companies whose pipe lines are Foxboro equipped.

The Dixie Gulf Gas Company, for example, has installed Foxboro Instruments *throughout* — on pipe lines — in compressor stations — in processing. Foxboro Orifice Meters provide records of flow that are bills of lading for goods delivered. They are accepted as sight drafts by the oil and gas industry for goods received. Accuracy that can be checked and cross-checked is characteristic of Foxboro Orifice Meters.

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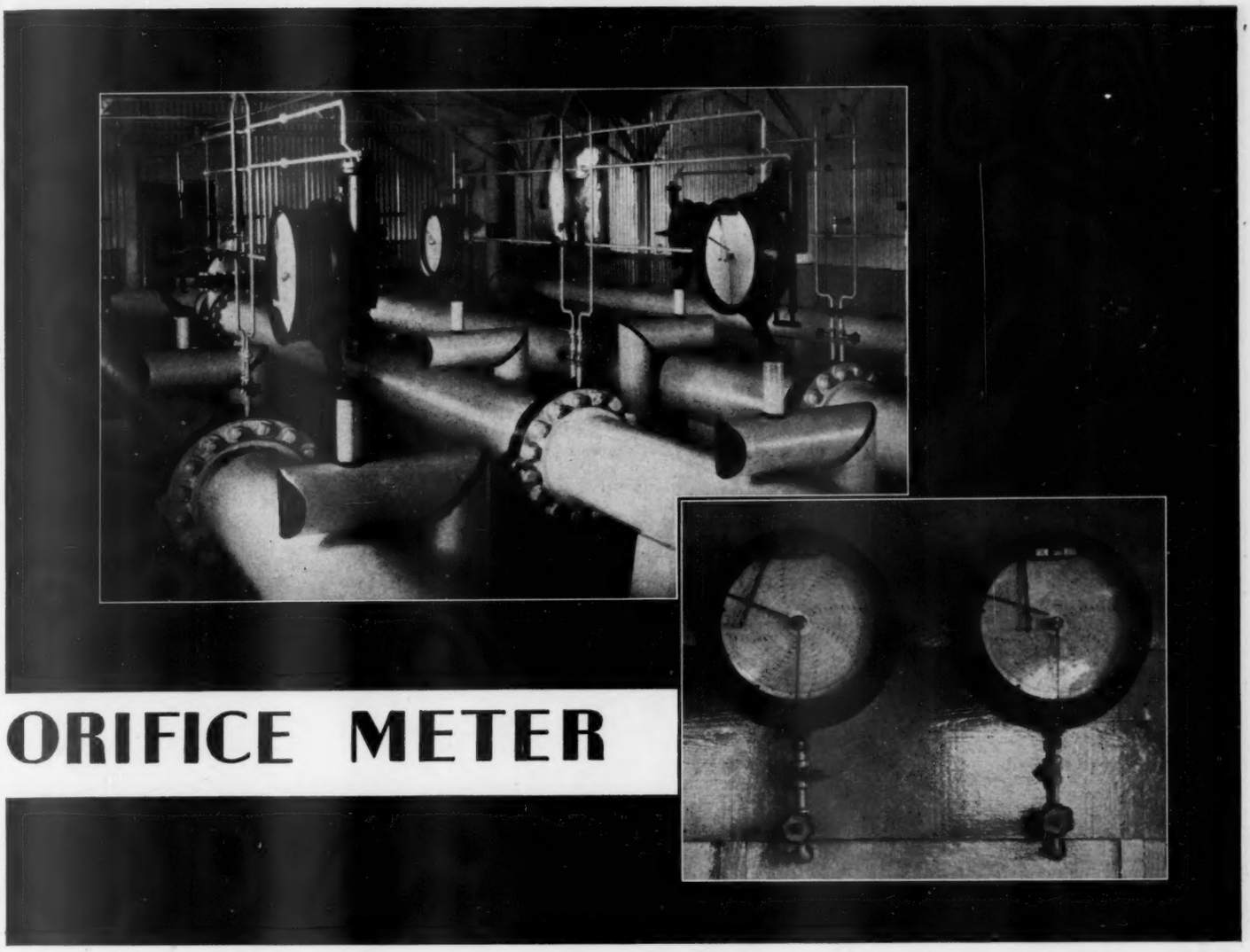

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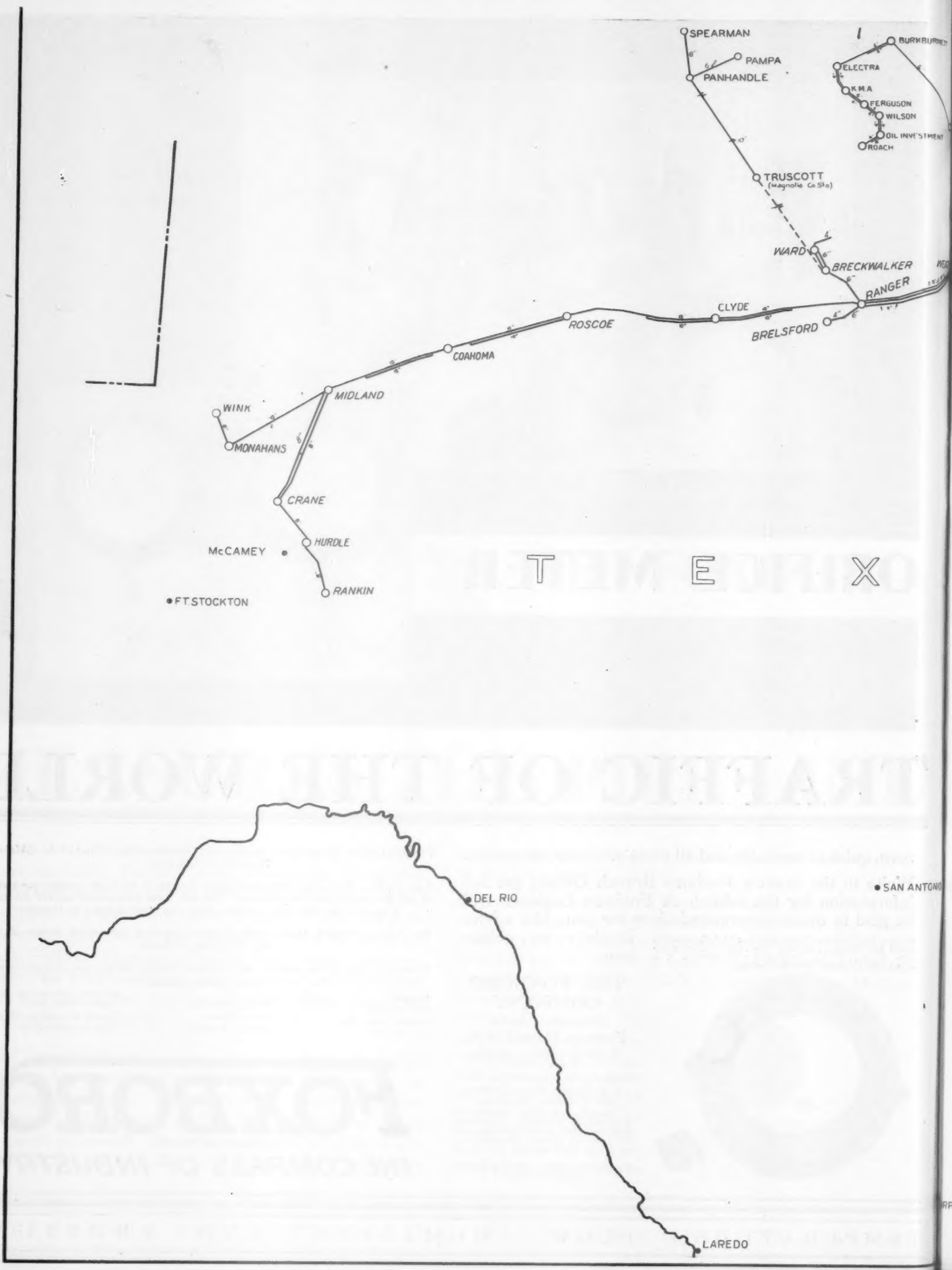

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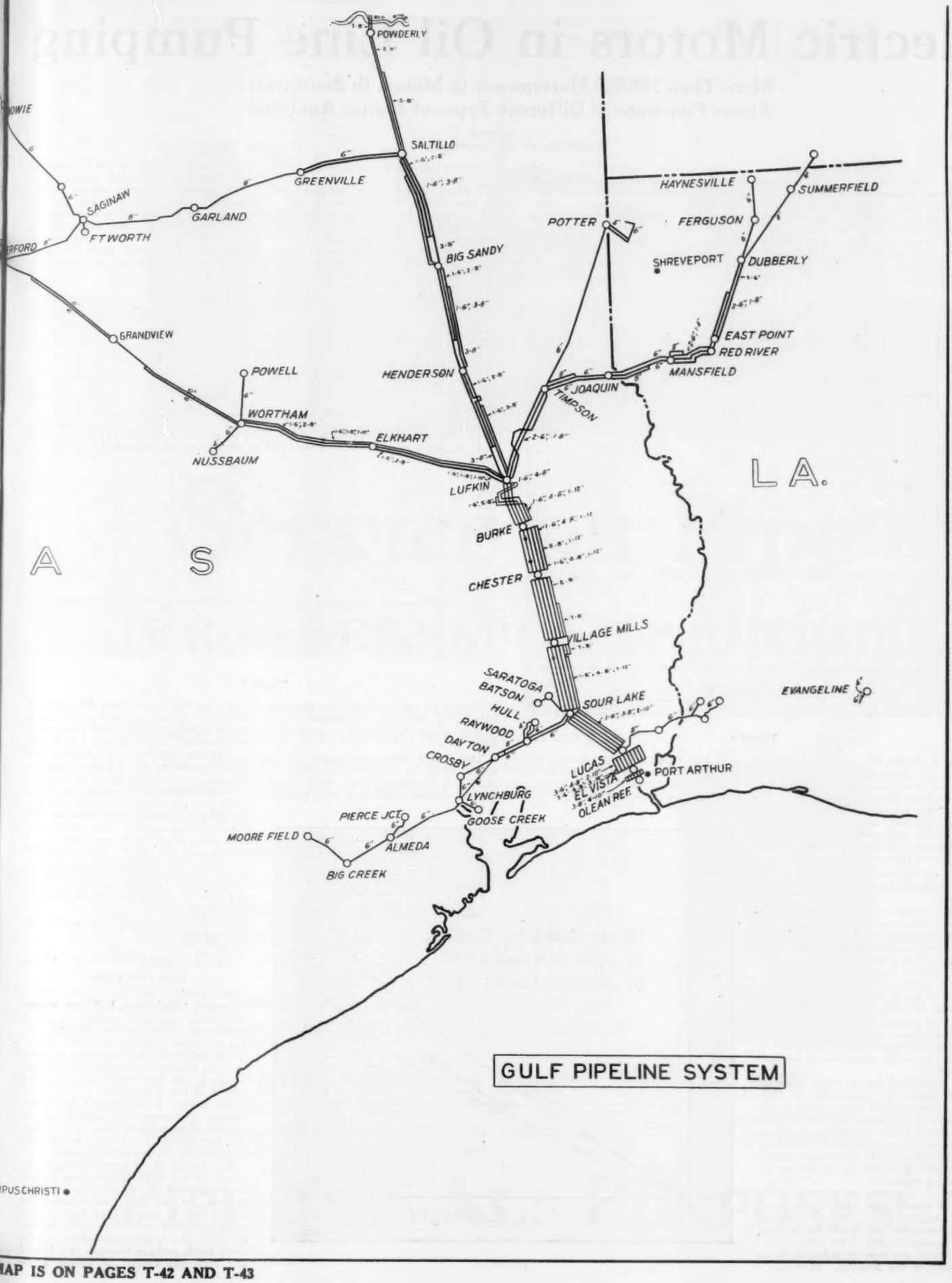

MAP IS ON PAGES T-42 AND T-43

Electric Motors in Oil Line Pumping

More Than 115,000 Horsepower in Motors in Southwest Alone. Functions of Different Types of Pumps Analyzed

By G. R. Prout
General Electric Co., Dallas, Texas

The oil pipe line industry has until recent years been dependent on oil engines of the Diesel or semi-Diesel types and the steam engine as a means of power for driving pipe line pumps. During the past few years, however, and particularly the last two years, the development of the use of electric motors by pipe line companies for driving main line oil pumps has been very rapid. There is at the present time over 115,000 hp. in motors driving main oil pipe line pumps in Texas, Oklahoma and Arkansas alone and this has nearly all been installed since January 1, 1927. There are three companies at the present time that have over 20,000 hp. each in such equipment and the total of electric motor horsepower for these three companies is about 70,000 hp.

There are perhaps several reasons for this development but two of the important ones are:

1. Power companies have increased capacities in their generating stations, and their transmission lines have spread out so that now electrical energy, from reliable sources, is available over a network of transmission lines, which cover or can readily be made to cover most of the territory over which the oil must pass on its way from the area of production to the refinery or market.

2. Motor-driven centrifugal pump units have been developed which handle oil at high pressures and capacities at good efficiencies.

The centrifugal pump, when operating at high heads, is essentially a high-speed machine, which accounts for the development of this pump with motor drive, consequently of the 115,000 hp. in motors driving main line pumps about 80,000 hp. is direct connected to centrifugal pumps. The remaining 35,000 hp. is driving reciprocating pumps.

There is, of course, in addition to the above, a considerable capacity in motor driven reciprocating and centrifugal pumps installed in gathering systems, which is not included in the above.

Naturally, the queston arises as to the economics of the problem. How can a pipe line company afford to purchase electrical energy for driving a motor, when oil, which can be used as fuel in oil engines, which are direct connected to the pumps, is passing through the pumping station?

The answer is, of course, involved, and a complete volume could be used in setting out the various solutions. Since there are so many things involved we shall only bring out some of the factors here which enter into the problem and which should be considered, without attempting to give actual values.

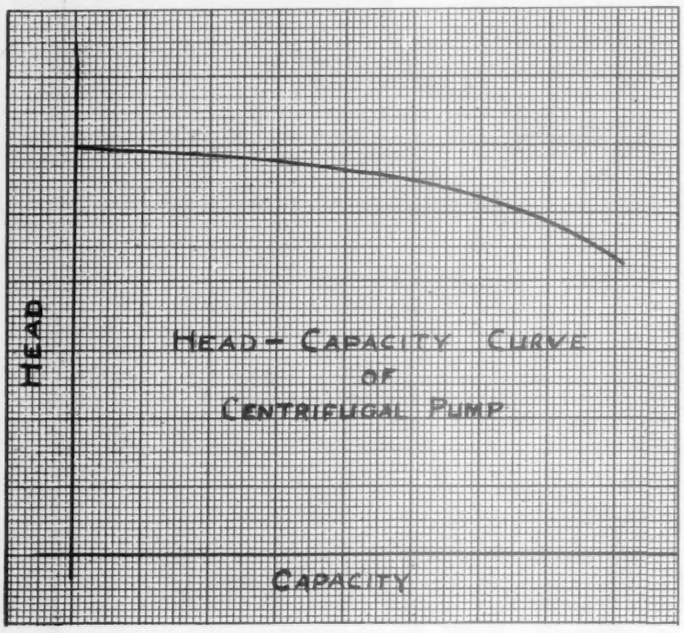

Figure 1.

The total pumping cost is made up of the following:

1. Fixed charges which include interest, depreciation, taxes and insurance.

2. Operating costs which include fuel or power costs, labor, maintenance and lubricating oils, waste, etc.

3. Overhead charges for management, supervision, etc.

The last factor mentioned above will, of course, be approximately the same regardless of the type of equipment used and so can be disregarded in a comparison.

The fixed charges are made up, as stated above, of interest, depreciation, taxes and insurance, and these fixed charges depend upon first cost, salvage value, rate of interest on the investment, and the tax and insurance rates.

The motor-driven pump station, whether centrifugal or reciprocating pumps are used, has a much lower first cost than the oil engine driven or steam engine driven pump station. It also has a lower loss in nonsalvageable material, hence the fixed charges are much less on the motor-driven stations.

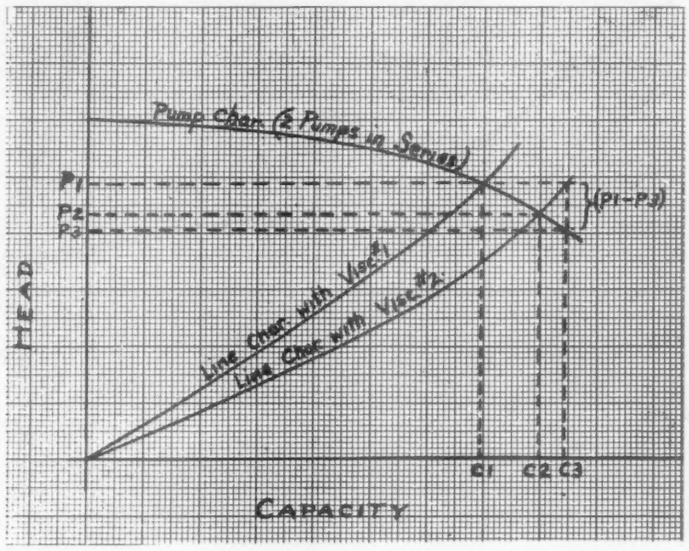

Figure 3.

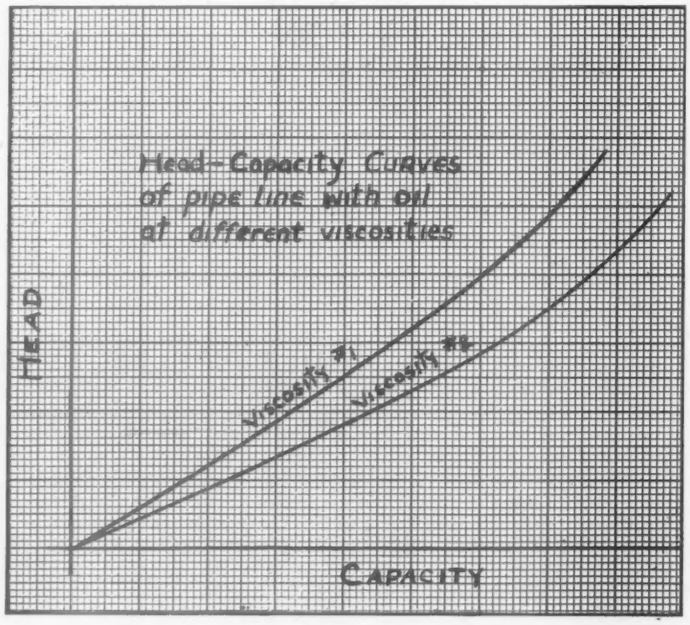

Figure 2.

To give some idea of the difference in investment required, as well as the values of salvageable equipment and nonsalvageable material we are setting forth below approximate costs of a motor-driven centrifugal pump station, a motor-driven reciprocating station and an oil engine-driven reciprocating pump station having a capacity of approximately 30,000 bbls. per day at a head of approximately 600 pounds per square inch. Each station has three units, one of which is a spare.

	Motor Driven Centrifugal Station	Motor Driven Reciprocating Station	Oil Engine Driven Reciprocating Station
First Cost	$45,000	$80,000	$200,000
First Cost of Salvageable Machinery	16,500	40,000	100,000
First Cost of Nonsalvageable Material, Labor, etc. ...	28,500	40,000	100,000

First Cost Values

The above first cost values include equipment, foundations, buildings, operators' houses, manifolds, valves, piping and installation. The type of building, the type of houses built for operators, the design of manifold and the number of tanks can vary the above costs, but we feel that the above are fair estimates of average stations of the types given.

The amount to be charged for depreciation, of course, will depend on the number of years the station is in operation and the value of the salvageable equipment at the end of this period.

The hazard of investment in any industry is one of the determining factors in fixing the rate of return expected by capital. In the pipe line industry the hazard may be greater than that in some other industries, on the one hand, but the prospects of a large rate of return, on the other hand, perhaps balances this hazard and sufficient capital is usually avail-

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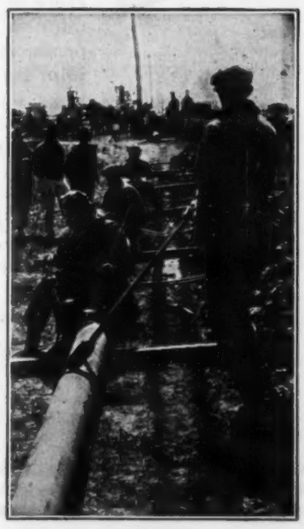

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able. Nevertheless, it is undoubtedly a decided advantage to keep the first cost down and the salvage value up as this always makes for more liquid assets.

The motor-driven centrifugal station has an advantage in that the equipment is comparatively small and light and can be readily moved to a new location.

The operating costs, as stated above, consist of fuel or power costs, labor, maintenance and lubricating oils, waste, etc. The fuel cost for the oil engine station is of course low and charges should be made for this oil only at the price of oil at the delivery end of the line. The power cost for the motor-driven station is a great deal higher than the fuel cost of the oil engine station, and is the largest operating cost of the motor-driven station.

The labor cost for the oil engine station is usually twice as high as the labor charge on motor-driven stations.

The lubricating oil cost of the oil engine-driven station is a great deal higher than on either the motor-driven reciprocating pump or the motor-driven centrifugal pump station. The lubricating oil cost on the motor-driven centrifugal pump station is exceedingly low and can almost be neglected.

A factor which is of great importance in the operating cost of a station is the capacity of oil handled by a pipe line over a period of years. If the capacity reduces year after year the fuel or power costs go down and since the power cost in the motor-driven station is such a large proportion of the operating cost, the reduction in this operating cost is much greater than in the case of the oil engine station where the fuel cost is low and is but a small fraction of the total operating cost.

The maintenance cost of the motor-driven station is very considerably lower than that of the oil engine-driven station.

In addition to the above, the motor-driven station has several inherent advantages over the oil engine-driven stations.

Matter of Water Supply

The first of these is due to the fact that the motor-driven station requires but little or no water for its operation, consequently, when station locations are being considered, the supply of water is not a problem. A second advantage is due to the fact that altitude has a much less effect on the operation of electrical equipment than in internal combustion engines and so the altitude of the station is not a hindrance to the motor-driven station.

The above two advantages tend toward allowing the lines to be more readily built on the arc of a great circle of the earth at a reduction in the length of the line.

Another advantage for the motor-driven station is that electrical energy is available for station lighting and for lighting, and appliances in the homes of the operators without installation of auxiliary engines and generators.

The motor-driven station also has an advantage in that the number of operators required is only half of the number required by the oil engine station, and this tends toward less labor turnover and less labor troubles.

Motor-Driven Centrifugal Pumps Versus Motor-Driven Reciprocating Pumps

The question of when to use motor-driven centrifugals and when to use motor-driven reciprocating pumps is one that of course arises and the answer is again dependent upon a number of factors.

It is generally conceded, however, that for main line booster work the centrifugal pump has everything in its favor. Its first cost is low, it is easily and quickly installed, and it is very easy to move from one location to another.

It is also generally conceded that the reciprocating or power pump has all of the advantages when the capacity to be pumped is small, usually less than 20,000 bbls. per day, or the viscosity of the oil is high, usually above 400 Seconds Universal Seybolt.

When other conditions of pumping are involved, that is, when the capacity is over 20,000 bbls. and the viscosity is less than 400 Seconds Universal Seybolt, there is a question as to what type of pump should be used.

The question of efficiency is an important one. The manufacturers of power pumps guarantee higher efficiencies for their unit than does the centrifugal pump manufacturer. If squirrel cage motors are used, however, the efficiency of the higher speed motor used on the centrifugal pump is usually somewhat better than is the efficiency on the slow-speed although if synchronous motors are used the difference in motor efficiencies will be small.

It is also necessary to take into account the losses in mechanical transmission to the reciprocating pump, the first costs and the question of whether or not the efficiencies of the pumps are maintained over a long period of time. For any particular problem these matters should be investigated and considered carefully.

Advantages

The advantages of the centrifugal pump station are:

1. First cost is low and loss due to unsalvageable material is low.
2. The pump house is small and the foundations are also small.
3. The installation is easily and quickly made.
4. The unit is comparatively small and light.
5. Motor is direct connected to pump.
6. Constant pressure can be readily and efficiently maintained with varying viscosities of oil.
7. Smaller manifold required.
8. This unit lends itself readily to automatic control.

Disadvantages

The disadvantages of the centrifugal unit are:

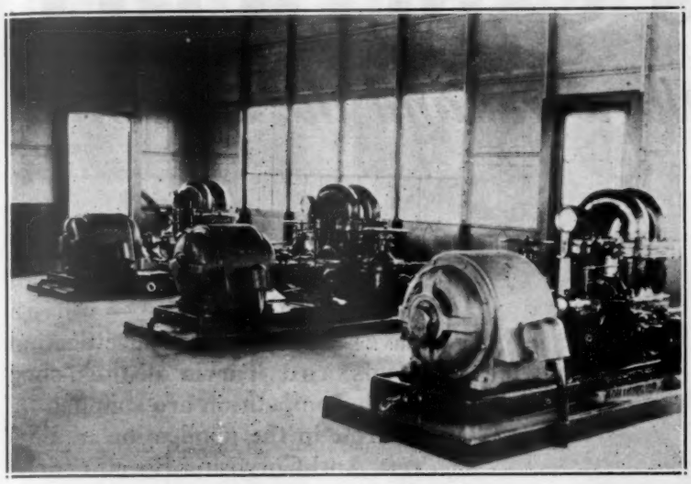
1. Lower efficiencies.
2. Units not available for handling all capacities and oil at all viscosities.

Reciprocating Pumps

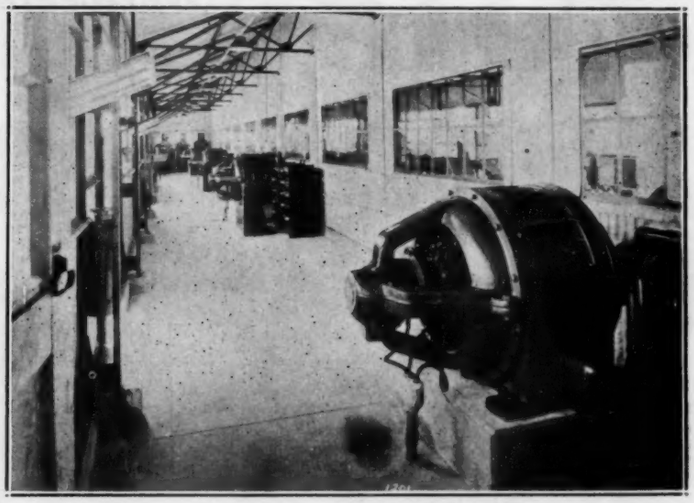
The advantages of the motor-driven reciprocating pumps are:

1. High efficiencies.
2. Can efficiently handle small as well as large capacities.
3. Has less loss in efficiency when pumping high viscosity oil.
4. Constant pressure at different oil viscosities readily maintained.

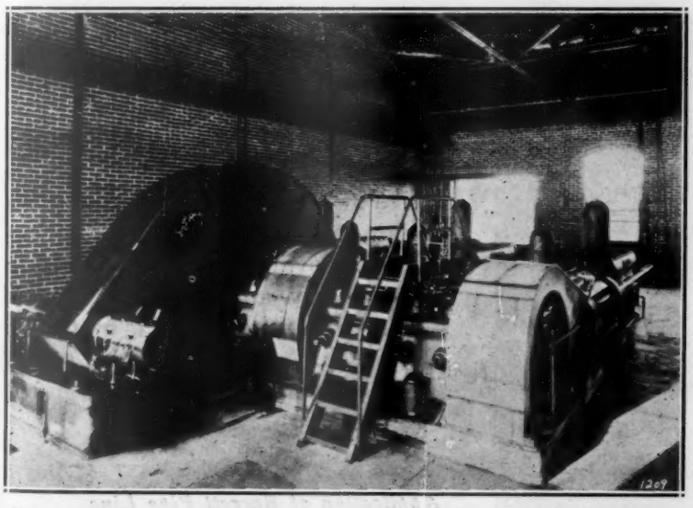
(Continued on next page)



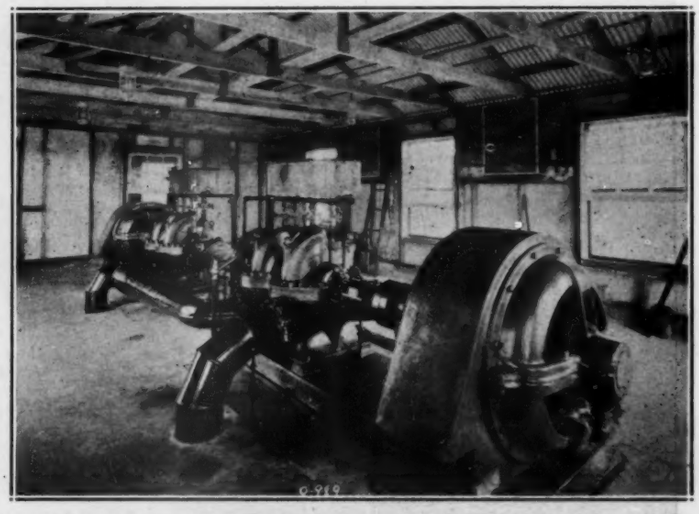
Induction motors driving Worthington centrifugal pumps at Bowie, Tex., station of Magnolia Pipe Line Co.



Lima station of Empire Pipe Line Co. Motors driving Worthington 15,000-bbl. pumps. In background are compensators for motors driving National Transit suction pump.



Prescott pump driven by Sychronous motor at Council Hill Station, Oklahoma Pipe Line Co.



Motors driving Byron Jackson pumps at Henryetta Station of the Oklahoma Pipe Line Co.

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The disadvantages of the reciprocating pump unit are:

1. High first cost.
2. Larger buildings and heavier foundations required.
3. Larger loss in unsalvageable equipment.
4. Longer time for installation required.

Maintaining Constant Pressure With Centrifugal Pumps

One disadvantage for the centrifugal pump has been raised by some pipe line engineers due to the fact that the head capacity curve of this type of pump is a drooping characteristic as shown in Figure 1 and constant pressure at different capacities cannot be obtained.

This has been pointed to as a disadvantage by those engineers who say that so long as there is oil to pump, a main line should be operated at its maximum allowable safe pressure at all times, in order to obtain the maximum pumpage throughout the year, regardless of the viscosity of the oil being pumped.

Undoubtedly the ability to maintain constant pressure under different conditions of operation is desirable, and it is possible to secure constant pressure throughout the year with the use of centrifugal pumps and still maintain overall station efficiency, in at least two simple ways.

1. By the use of a single-stage booster pump driven by an adjustable varying speed motor and to be used in series with the main pumps.
2. By changing pump impellers.

Figure 2 shows pipe line characteristics for a pipe line with oil at two different viscosities.

This difference in viscosity might be due to either a change in temperature of the same oil or it might be due to a change in the kind of oil being pumped. In either case the results will be the same.

By superimposing the main pump head-capacity curve onto the pipe line characteristics, as shown in Figure 3, it is evident that when the viscosity drops, the capacity will go up, but the pressure will drop. If P1 is the maximum allowable pressure, it will obtain on the highest viscosity oil and P2 will be less than P1 although the capacity, C2, will be greater than the capacity C1, however, if the pressure P1 was maintained on the lower viscosity oil, the capacity C3 would be obtained and this capacity would be greater than either the capacity C1 or C2.

Now as the two viscosities chosen are the maximum and minimum that will be incurred, then a booster pump capable of handling full capacity with a maximum head of P1 less P3 will be satisfactory. Since the pressure of a centrifugal pump varies as the square of the speed, it is evident that, if an adjustable varying speed motor is used, any oil with viscosities between the maximum and minimum values to be handled by a line can be handled at any pressure less than P1 minus P3, but this pressure will always be sufficient to maintain station pressure at P1.

On a certain 50,000-bbl. per day pipe line, and with certain main centrifugal pumps, it was found that P1 minus P2 was about 70 pounds and P1 minus P3 was about 75 pounds. A single stage booster pump was installed to handle full capacity at 75 pounds pressure. This pump required a 75 hp. motor. The two main motors were 400 hp. each and the load on them was approximately 360 hp. each, so that the total station load was approximately 795 hp. with summer viscosity, and the two main units with the booster unit running.

Seasonal Operation

In the winter the booster pump is to be shut down entirely, but during the fall and spring it is to be run at such a speed as will give the required boosting pressure, even though this be as low as 10 or 15 pounds. At a pressure of about 15 pounds this pump will require about 19 brake hp. The overall motor efficiency running at low speed, and including resistor losses, would be about 58 per cent which would mean that approximately 14 hp. would be lost in the motor and resistor. The total station load under these conditions will be approximately 750 hp. So it is evident that the 14 hp. loss in the 75 hp. motor and resistor would only affect the overall station efficiency about 1¾ per cent. The booster pump efficiency at this low head is about 60 per cent and therefore an additional loss of 7½ hp. will be lost in the pump so the total effect on the overall station efficiency is only about 2¾ per cent.

The efficiency of the booster unit, when running at full speed, which will be during the summer months, is about the same as the efficiency of the main units, and consequently maximum efficiency is obtained. When the booster unit is running at reduced speeds the efficiency of the station is somewhat less than the maximum efficiency, but the booster pump never causes the station efficiency to reduce more than about 2¾ per cent.

The slip ring motor used was furnished with collector rings mounted in an enclosure which is designed in accordance with the requirements of the United States Bureau of Mines, for operation in an explosive gaseous atmosphere and consequently this motor is comparable with the ordinary squirrel cage motor of the type being used to drive the main pumps.

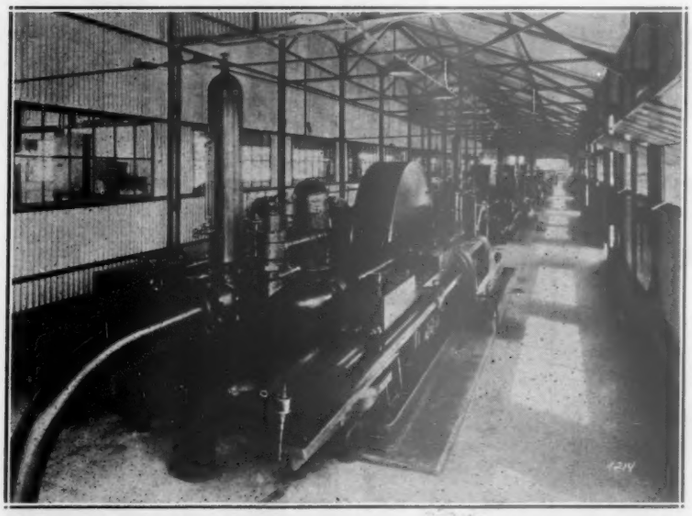
The control for this motor is mounted in the control room with the rest of the electrical control equipment and the speed of the motor is easily controlled by the operator, who can watch the station discharge pressure gauge and can adjust the speed of this motor so that constant pressure can be maintained at all times.

Since the viscosity of the oil will remain constant for comparatively long periods of time, it will not be necessary for the operator to change the speed of the booster pump motor frequently even though he can readily do this. This feature could be made automatic with the line pressure as the controlling factor, if this was desirable.

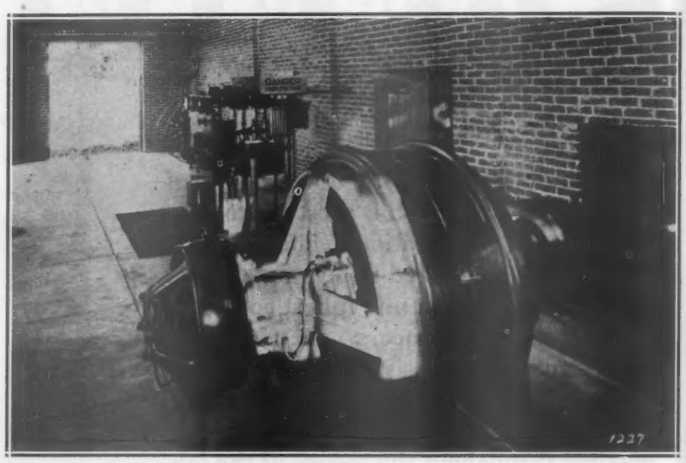
From the above it is evident that constant pressure can be economically and conveniently maintained by this method throughout the year, regardless of the viscosity of the oil.

There is another point worthy of consideration here and that is, this method of pressure control allows the designer of the pipe line some flexibility in design. A station location may not be at exactly the right point on the line due to some slight error in assumptions of viscosity, then this arrangement will take care of the situation.

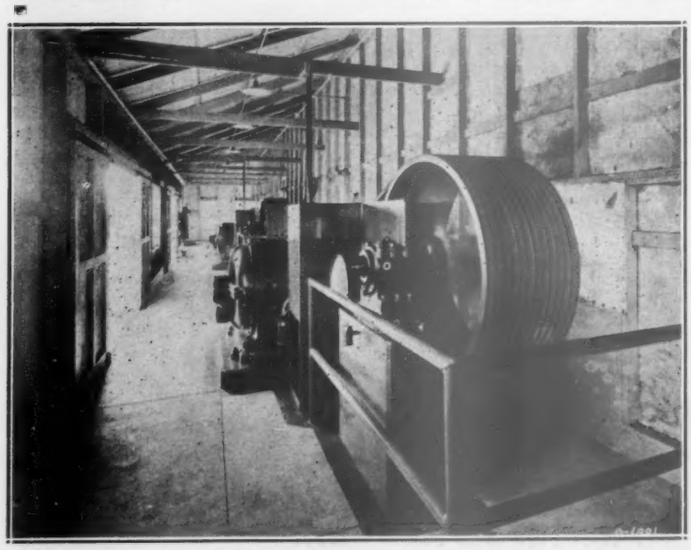
The cost of such booster equipment including motor, control, pump and installation, would not increase the station cost more than $3,500 or approximately 6 to



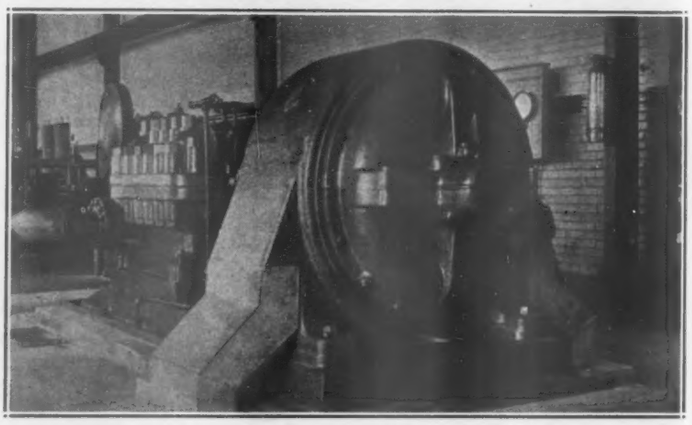
Empire Pipe Line Co.'s Lima Station in Oklahoma showing four Worthington 15,000-bbl. reciprocating pumps.



Synchronous motor with magnetic starter driving Prescott pump at Council Hill Station, Oklahoma Pipe Line Co.



Motors driving National Transit pumps at Sinclair Pipe Line Co.'s station at Seminole, Okla.



Squirrel cage induction motor driving Cameron pump in station of Standard Pipe Line Co. at Mandenville, Ark.

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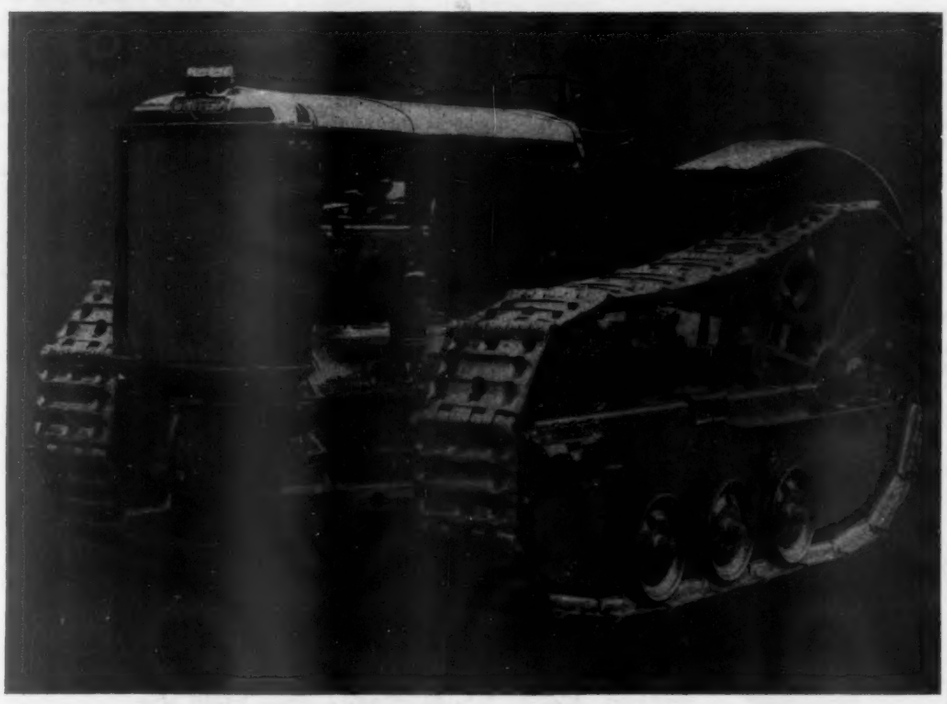

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Products
The UNITED Crawler Tractor
The UNITED Hoist, Model Chief

7 per cent of total station cost.

The method of changing impellers would not be as convenient, or flexible as the foregoing method, nor would the correct pressures be obtained at all times. An approximation can be reached in this way, however, at a comparatively low cost.

Frequently three centrifugal units are installed, two of which operate in series, and the third a spare. It would be possible to have different impellers in each pump. Then by operating various combinations different pressures and capacities could be obtained. Then with one change of impellers in addition to this, a fairly flexible arrangement could be obtained. However, the first cost of the extra set of three impellers, one for each pump, would be about 50 per cent of the installed cost of the booster pump. Considering the cost of changing impellers at least twice a year, the booster proposition seems the better of the two, when one considers the additional flexibility and convenience of operation to be obtained.

There are other methods of obtaining these results, namely:

1. By the use of slip ring adjustable varying speed motors on the main pumps.

2. By the use of slip ring motors with pump-back or Scherbius control method.

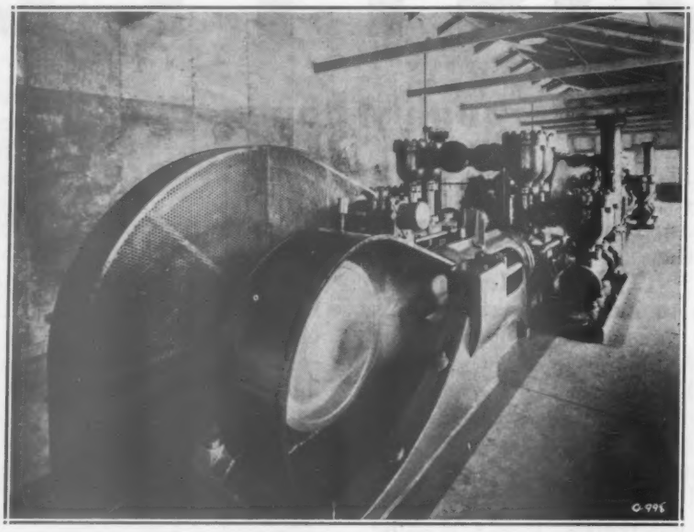
The first of these methods would be convenient but not very efficient and the second involves expensive equipment which is quite complicated and which undoubtedly would entail difficulties in operation.

Automatic Control

The problem of automatic control of a motor-driven centrifugal pump station has several angles to it.

If there is a surge tank at each station, it would be relatively simple to automatically control the motors in such a station. If there is no tank, the arrangement of control for automatic operation is also quite simple, providing the station is preceded by another centrifugal pump station. If there is no tank, and if the preceding station is a reciprocating pump station, the problem is more difficult because of pressure variations or pulsations, due to the reciprocating pumps.

The advantages of havng an automatically operated station is the reduction in labor made possible thereby, however, at the present stage of development there should be at least one operator available at, or near, the station at all times.



Two National Transit pumps driven by motors in Sinclair Pipe Line Co.'s station, Seminole, Okla.

Full automatic control of electric railway substations and water power generating stations, has been accomplished and is quite common today. The problems involved in such automatic control are far more complicated than the problems involved in the automatic control of oil pipe line pumping stations, where centrifugal pumps are used and there is no reason why, with careful application and study, a complete line could not be operated entirely automatically, with the supervision of the dispatcher, and with trained inspectors stationed at strategical locations along the line.

Up to the present time the only attempts at making stations automatically controlled have been by using the pressure in the pipe line as the controlling factor. Arrangements have been made to shut stations down, with loss of suction pressure, and also for shutting down the station, with loss of discharge pressure which would indicate a line break on the discharge side of the station. Provisions have also been made to automatically shut down stations on high discharge pressures which would be caused by operating against a closed valve. Attempts have been made to automatically start and stop the station under operating conditions, by using the suction pressure as the controlling factor.

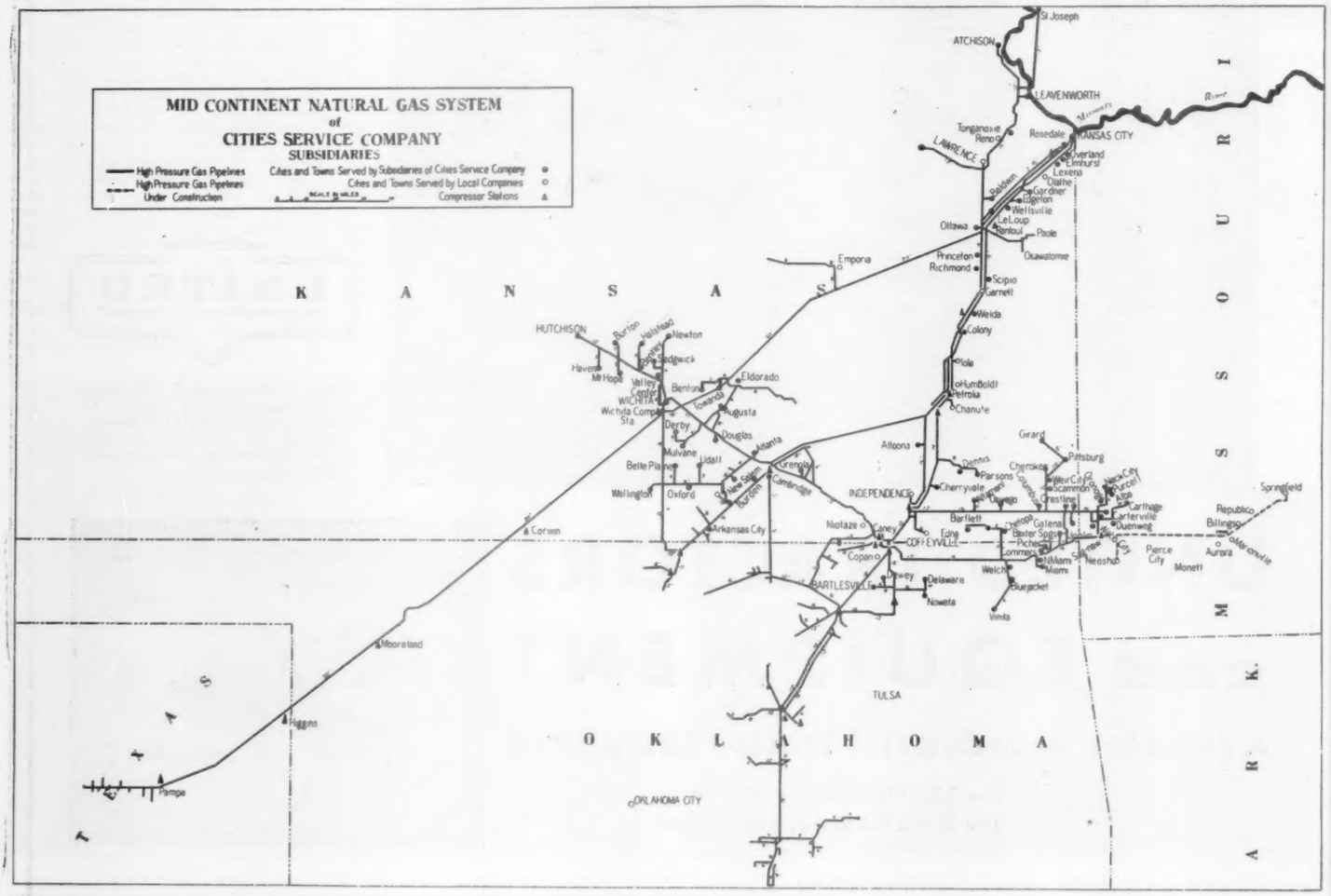
Conclusions

The fact that there is already installed in main oil pipe line pumping stations over 115,000 hp. in electric motors shows that the pipe line operators have investigated, and have accepted, the electric motor as an economical device for driving main line oil pipe line pumps. This same fact shows that the power companies are in a position to render a highly efficient service for this application.

The motor-driven station, whether centrifugal or reciprocating pump is used, has advantages due to:

1. Low first cost.
2. Small loss in nonsalvageable material.
3. Less labor required.
4. Shorter time of installation.
5. Electric power available for lighting and other conveniences without requiring installation of generators at pump station.
6. Characteristics of country through which the line must pass, such as quantity of water available and altitude, has less effect on station location and consequently the line can be more nearly built on the arc of a great circle of the earth.
7. Fewer auxiliaries required.
8. Simpler manifold needed.

The motor-driven station, particularly when the centrifugal pump is used, will readily allow full automatic control and it is to be expected that tendencies in the future will be more and more toward this feature.



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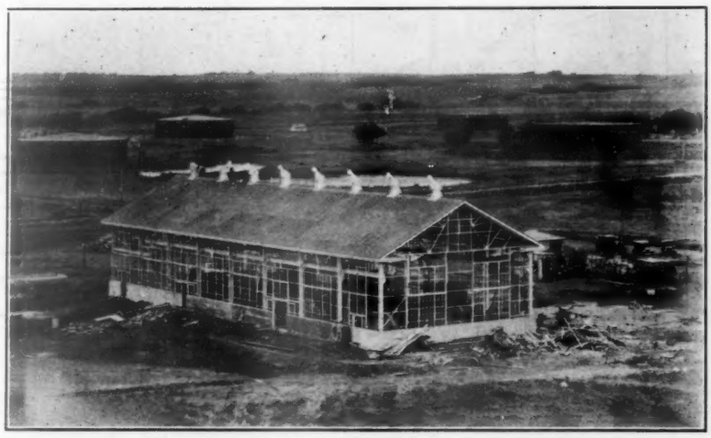
Note the sturdy, pleasing appearance of this Manning Lease Houses, one of many which have been sold to this major operating company. Manning Portable Houses have the appearance of built houses in every respect, inside and out. Manning Houses are more tightly constructed, and have fewer construction joints. Be sure to see the Manning Portable House which will be erected complete on the Exposition Grounds. It will be exhibited back of The Oil & Gas Journal booth. We will gladly furnish complete information about Manning Portable Lease Houses, Bunk Houses, Farm Houses, Tourist Camp Houses, Garages, etc. Write:

OIL STATES MANUFACTURING CO.

Tulsa, Oklahoma



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Builders of Manning Portable Houses

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A complete stock of supplies and equipment for the machine shop.

TULSA, OKLAHOMA

MAIN LINE PIPE LINE STATION

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Now constructing for one of the largest pipe line operators, this station is an example of the careful engineering and contracting which Dresser & Gorton, Inc., offers to pipe line and oil companies in turn-key construction and contracting of steel building, compressor station, gasoline extraction plants, etc. A fully equipped and experienced organization that is prepared to take care of any type of construction job.

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Engineers and Constructors

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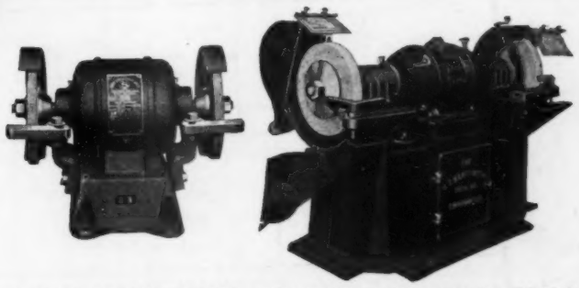

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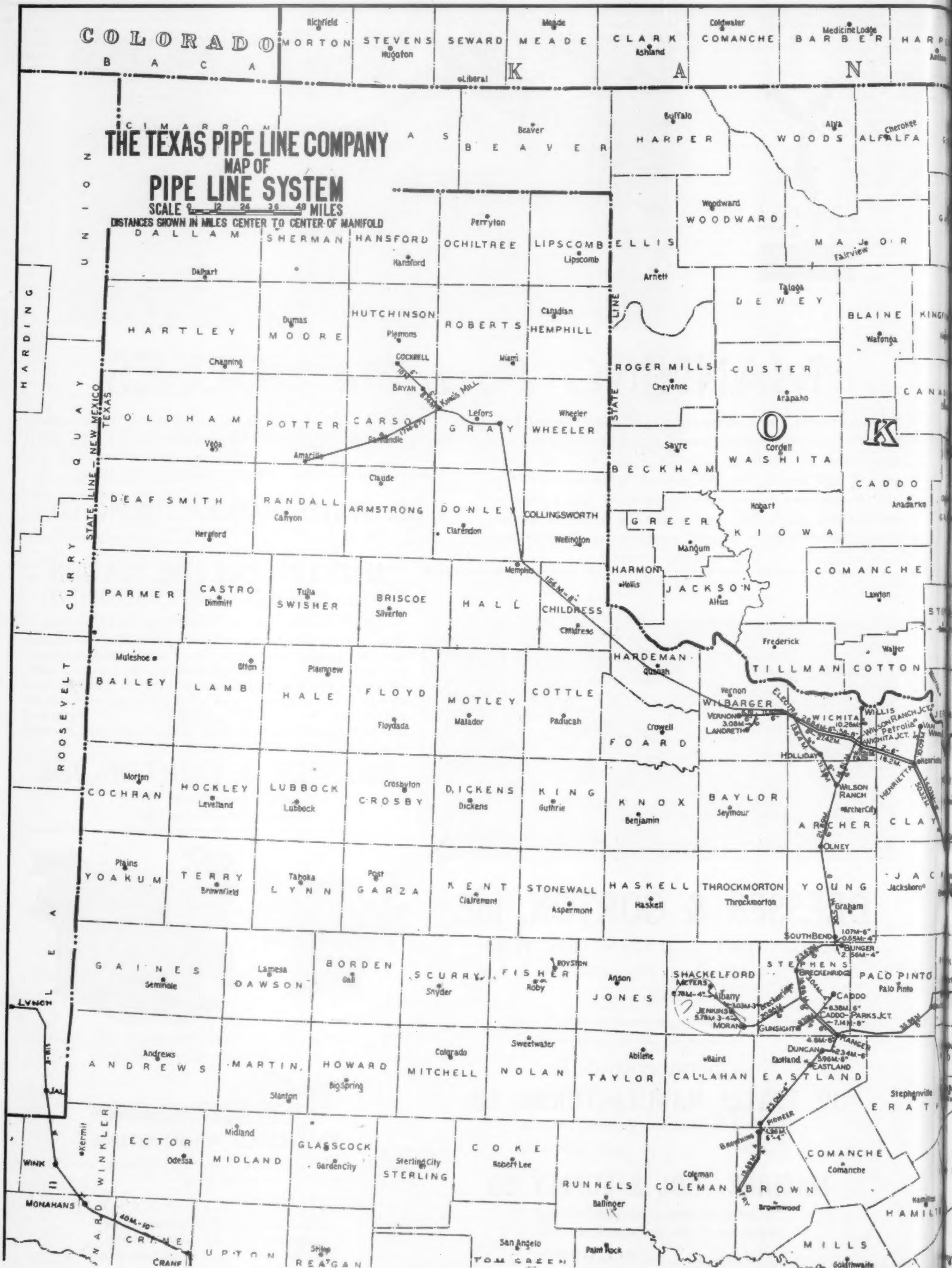

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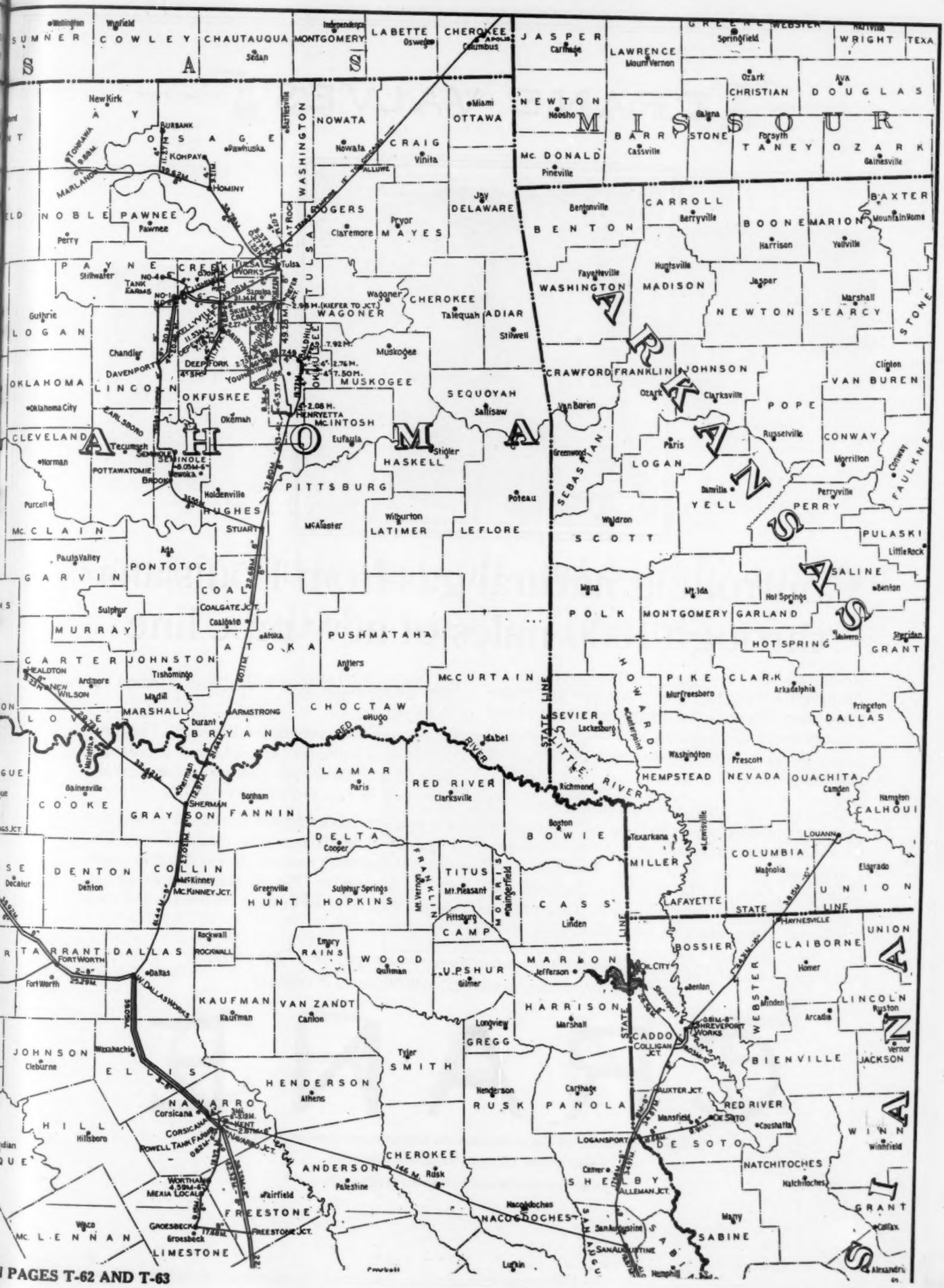
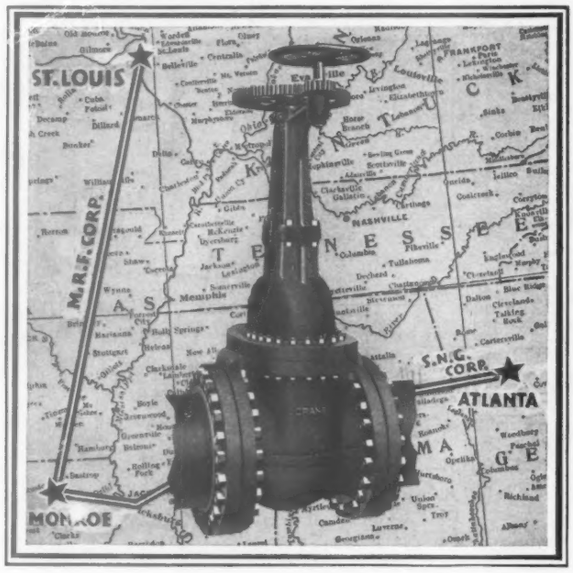


ON PAGES T-62 AND T-63

150 Pounds Pressure

CRANE VALVES

2500 Pounds Pressure



Controlling natural gas from Louisiana through 1000 miles of new pipe line

A graphic story of today's natural gas transportation . . . and the service of Crane piping materials in this work . . . is told by the map that shows routes of two new pipe lines, now building.

These new gas lines, among the longest in the country, make the vast natural gas resources of northern Louisiana available in Arkansas, eastern Missouri, Illinois, Mississippi, Tennessee, and Georgia. One, of the Southern National Gas Association, runs from Monroe, La., east to Atlanta. The other, of the Mississippi River Fuel Corporation, goes north from Monroe to St. Louis.

Each is approximately 500 miles long. They use thousands of valves and fittings, many big enough to fit 22 inch O. D. pipe, others of the smallest sizes used in this service.

The builders have adopted Crane valves and fittings for these lines. Thus again, Crane Co. serves the growing needs of the gas industry, from well to consumer. Thus again, experienced gas engineers give proof of their confidence in Crane piping materials.

For full data on valves and fittings for any gas or oil purposes, car load lots or single valves, simply send a request

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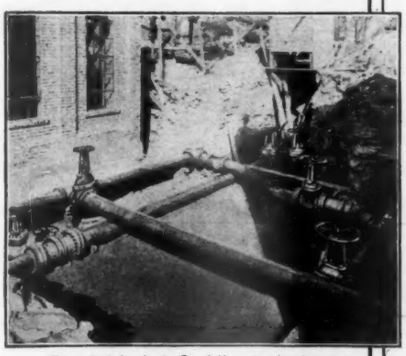
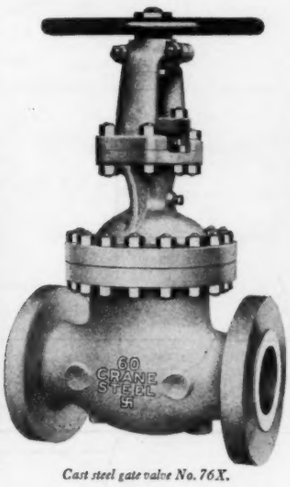
150 Pounds Pressure

CRANE VALVES

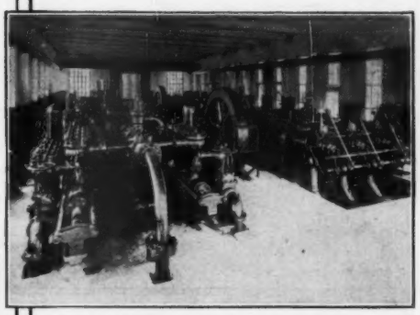
2500 Pounds Pressure



View of piping in the Ozark line, showing Crane cast steel valves and fittings in place.



Cast steel gate valve No. 76X.



One of the high pressure pumping stations in the Ozark line. Equipped with Crane cast steel valves, fittings, and piping materials.

One of the many Crane gate valves which stand guard over oil flow through the Ozark pipe lines.

Guiding oil from Gulf and Mid-Continent all the way to Chicago

As clearly as the new gas lines from Louisiana to Atlanta and St. Louis tell the story of Crane service in the gas industry, the now lengthened Ozark oil pipe line from Pasadena, near Houston, Texas, through Oklahoma to Chicago tells of Crane service to the oil industry.

The first section of this line of the Roxana Oil Corporation was laid down in 1917-18. It ran from Healdton, Okla., over the Ozarks to East St. Louis, 555 miles away. It carried 24,000 barrels of oil daily. To furnish the power to drive the weight of heavy crude oil through the 10 inch pipe to its destination, working pressures must necessarily be high, 900 pounds. Under such a load, only thoroughly dependable valves and fittings could hope to stand up and endure.

Map showing route of Ozark pipe line from Pasadena, Tex., through Winkler Co., Tex., to Healdton, Okla., thence to Wood River, Ill., and on to Chicago.

Crane valves and fittings were chosen. So satisfactorily did they serve that when a second line, paralleling the first, was laid in 1925, Crane valves and fittings were again installed.

And now that the line is being augmented, to handle larger quantities of oil from the Gulf to Chicago, and from the Mid-Continent fields to Chicago and the Gulf, once more Crane materials are chosen.

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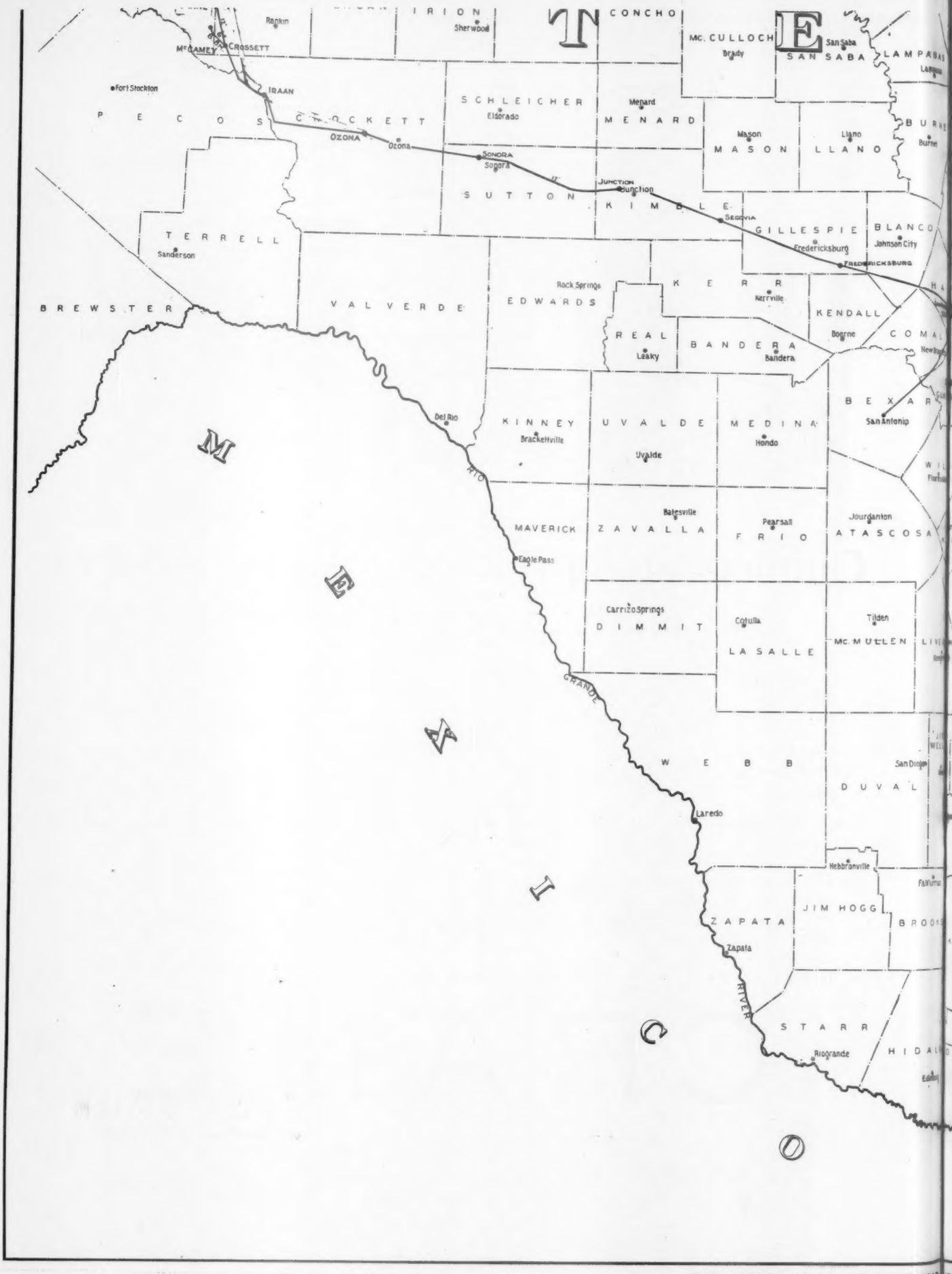

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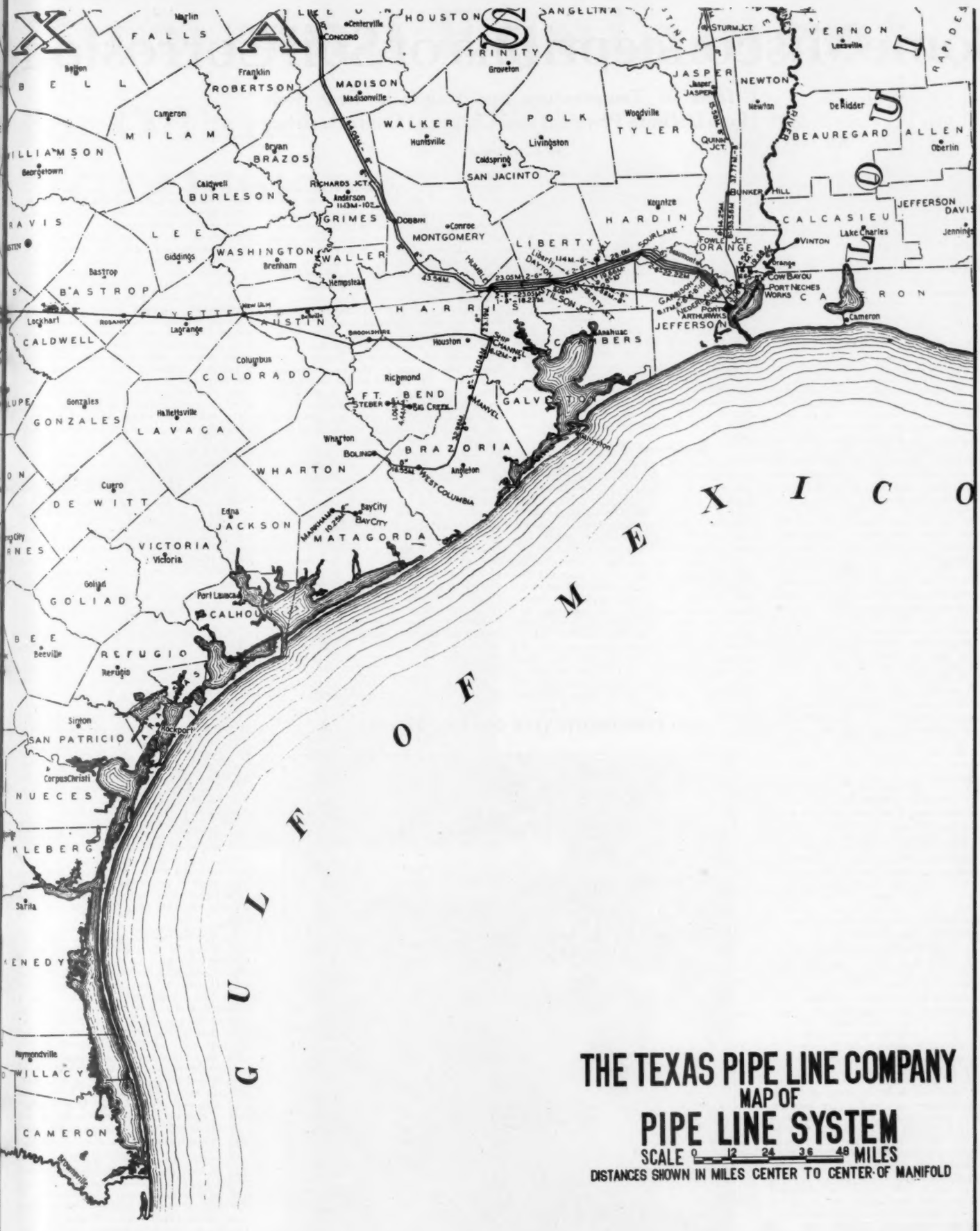


THE TEXAS PIPE LINE COMPANY

MAP OF

PIPE LINE SYSTEM

SCALE 0 12 24 36 48 MILES

DISTANCES SHOWN IN MILES CENTER TO CENTER OF MANIFOLD

IS ON PAGES T-58 AND T-59

Some Misconceptions of Soil Corrosion

Effects of Temperature and Rainfall. Few Soils Have Definite Physical and Chemical Characteristics

By K. H. Logan*

Anyone who attempts to set his associates right regarding almost any subject, at once exposes himself to the Biblical admonition that he should first remove the beam from his own eye before attempting to remove the mote from his brother's eye, and the belief is rather general that when it comes to theories of soil corrosion, one man's guess is about as good as another's. The following observations may therefore be regarded as the opinion of one observer of soil corrosion phenomena who believes he is right, but is willing to admit the possibility that after all he is at best only partially right.

The deterioration of metal pipes buried in the earth and not exposed to the action of stray electric currents is generally spoken of as soil corrosion and attributed to characteristics of the soil. Two misconceptions may arise in this terminology. In the first place, the corrosion of underground metallic structures is affected by temperature and rainfall, which are characteristics of climates rather than soil; and secondly, few soils have definite physical and chemical characteristics in the restricted sense that a metal or chemical compound has. For example, Cecil clay has certain physical and chemical properties distinguishing it from Norfolk sand found in adjacent territory; while either of these soils may be defined with some degree of precision, two samples of either may differ materially among themselves. Moreover, the corrosion of a pipe buried in either of these soils is determined partially by the depth of burial, the drainage of the trench and the way in which the soil is compacted against the pipe, as well as by climatic conditions.

Consequently the corrosiveness of a given soil cannot be expressed with the accuracy with which we can predict the rate of corrosion of a certain type of metal in a given solution of sulphuric acid. We will do well if we learn to express soil corrosiveness even roughly.

Occassionally, at least, some one appears to have the idea that the same soil can be found in widely different parts of the country. Each soil is the result of certain geologic and climatic conditions and usually is limited to one section of the country. For example, Norfolk sand, which has an unusually wide distribution, is found only in the coastal plain bordering the South Atlantic and Gulf states. The sand in New England and that bordering the Great Lakes is not Norfolk sand because the region and characteristics are different.

Rates of Corrosion

As a result of the Bureau of Standards soil corrosion investigation some have reached the conclusion that the rates of corrosion of all ferrous materials in a given soil are substantially the same. Such a conclusion is too broad to be justified. The investigation referred to is unfinished and shows only the rates of corrosion for certain ferrous materials for the first six years of exposure. It is safe to say that all of the materials under test represent high grade products, carefully made. To date the differences between the rates of corrosion of these materials are small, but to conclude on this account that all ferrous materials are equally good is unwise. Just as no baseball fan would base a prediction of the outcome of a game on a tied score in the fourth inning, so judgment as to the relative merits of materials should be suspended until the investigation is concluded.

The electrolytic theory of corrosion which is now rather generally accepted, was once fairly simple and accounted for differences in corrodibility by differences in surface conditions of the metal such as local strains or impurities or the joining of two different metals. It can scarcely be doubted that these things aid corrosion. Later observations, however, make it evident that equal or greater differences of potential result from conditions external to the metal, and these frequently obscure the virtues of homogeneous metal structure. For example, analyses show a certain brand of open hearth iron to be approximately 99.85 per cent pure iron and consequently one might expect it to suffer little corrosion. But when this iron is rolled into pipe we find it covered with oxide or mill scale and the potential between this scale and the pure metal is of the same order or magnitude as that between mill scale and ordinary iron or steel, and thus some of the benefits of pure matrial are lost.

Differences in Contact

Moreover there are strong indications that differences in contacts between the soil and pipe as well as different soils in contact with the same pipe account for part of the corrision. We must conclude, therefore, that the elimination of corrosion cannot be accomplished solely by the use of a pure metal.

It is fairly obvious that a metal suitable for one type of service may not be especially fitted for a different service, yet because a certain alloy has been found to be superior in its resistance to corrosion when exposed to air, some have assumed that it is also superior when made into pipe for underground use, although tests have shown that it is not especially resistant to underwater corrosion. If a metal is superior under one condition, this is a justification for trying it for some different condition, but our decision as to its merits should await the results of the trial.

A rather amusing misconception of the distribution of slag in wrought iron was brought to the writer's attention some years ago when he was removing soil corrosion speciments in a southern city. Among the spectators was a representative of one of the manufacturers of wrought iron who was rather voluble in his explanation of the virtues of the slag layer in wrought iron as a means of preventing corrosion. In the course of his talk he was asked just how far corrosion could be expected to penetrate before it was stopped by the non-corrodable slag layer. He turned to the writer and asked the depth of the deepest pit found on wrought pipe in the previous examination of specimens, and on being told that the pit depth was about 0.02 inch, replied that that was about the depth of the slag layer below the pipe surface. Unfortunately, under some soil conditions, the pits in his material have penetrated much deeper. If he had examined photomicrographs of sections of wrought iron he might have discovered that the slag does not exist as an envelope for each particle of iron, as some have claimed, or as a layer somewhere beneath the surface of the metal, but in the form of plates scattered throughout the metal and extending in the direction in which the metal was rolled, and that the spaces between the plates are usualy much greater than the diameters of the plates, so that while the slag plates may resist corrosion there is always a considerable amount of iron exposed to corrosive action.

Usually statements in advertising must be brief, and it follows that they frequently are too broad to be accurate. Much of the public's information has its source in these general statements which, while generally true, are incorrect under some specific circumstances. Without reflecting on the well recognized merits of the products sold under the slogan, "The pipe which lasts throughout the ages," it is only fair to the consumer of this material to say that occasionally cast iron fails to live up to this claim of non-corrodibility. Indeed, so far as the Bureau of Standards soil-corrosive investigation goes, the rate of corrosion of cast iron is not greatly different from that of other ferrous pipe materials, and field experience indicates that in a few soils the corrosion of cast iron is rather rapid. Cast iron differs from wrought iron and steel in two particulars, both of which have helped to establish its reputation as a long-lived pipe material. One is that under many soil conditions the rate of penetration of corrosion decreases with time and is much less 10 or 15 years after the pipe is buried than during the first few years. On this account a pipe with a thick wall has an advantage, since a very thin wall may be punctured during the first few years of relatively rapid corrosion. The other advantage is that the corrosion products of cast iron form, under favorable conditions,, a rather hard product which remains in place and withstands a considerable pressure. The value of this property is illustrated by an experience of the writer while studying the corrosion of working gas lines. In a certain city the manager of a gas company was quite willing to co-operate by exposing his mains at selected places, but assured us that we would find little corrosion, since he had experienced no trouble from this cause. In the course of the first day's investigation and in the presence of the manager, one of the representatives of the cast iron pipe industry dug a hole entirely through the wall of one of the pipe with a small testing hammer, much to the surprise and embarrassment of all of those present. The pipe had been in service over 50 years, and while it was generally corroded to a greater or less extent, there is every reason to expect that with a leak clamp over the hole that was dug in it, the pipe will continue to serve its purpose indefinitely. Somewhat similar cases of the continued service of corroded cast iron have been encountered elsewhere, and it is believed that they partially account for the enviable reputation of cast iron pipe.

In conclusion, the belief that soil corrosion can be distinguished from stray-current corrosion by the distribution of the corrosion or the character of the corrosion products, may be considered. Like most misconceptions this belief has a foundation of fact but a superstructure of fancy. Serious stray current usually occurs only where current leaves one pipe to pass into an intersecting conductor, such as a street car rail, a cable sheath or another pipe. This frequently results in localized pitting, which is said to characterize electrolysis, but localized pitting may also occur when there is a localization of bad soil, when cinders are thrown into the trench, and at spots where there is a concentration of moisture or alkali.

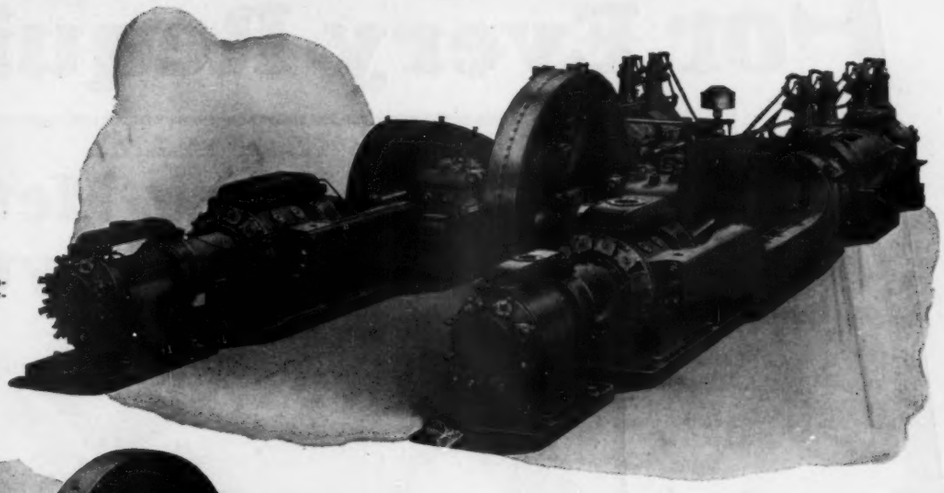
Likewise the so-called graphitic corrosion of cast iron is an indication of corrosion so rapid that the supply of oxygen is insufficient for the formation of the red or yellow oxides. Electrolysis may cause rapid corrosion and produce the black ferrous corrosion product, but corrosive soils in which the supply of oxygen is very limited produce similar results, and consequently we cannot depend on the appearance of the corrosion product as an indication of the cause of the corrosion.

APPLYING PROTECTIVE COATING TO PIPE LINE

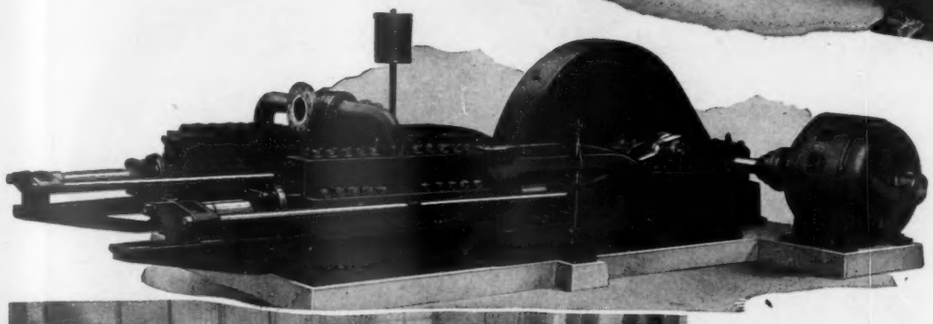
*United States Bureau of Standards. Written especially for The Oil and Gas Journal.

Pumping Equipment

for Oil and Gas Lines



Gas Engine Driven Compressor for boosting pressures in gas lines.



Forged Steel Pipe Line Pump, Motor Driven.

25,000 Bbl. per day Motor Driven Type "M" Centrifugal Pumps driven by 225 H.P. Allis-Chalmers Motors.

150 H.P. Allis-Chalmers Motor and Texrope Drive operating Pipe Line Pump.

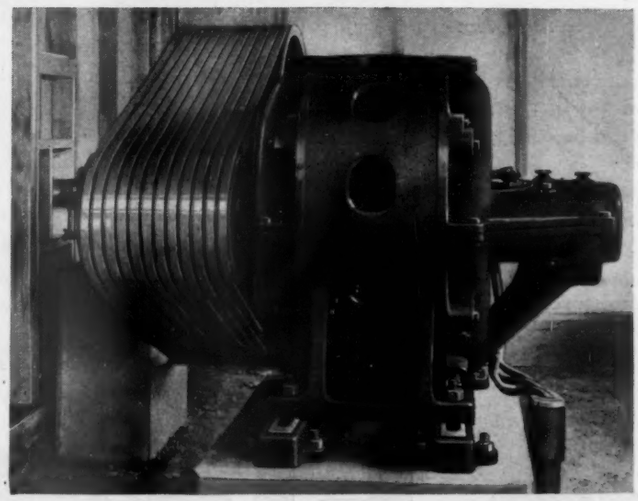
A COMPLETE line of plunger as well as centrifugal pumps for oil pipe line service, is built by Allis-Chalmers Manufacturing Company. Forged steel pipe line pumps are designed and built for high pressures and heavy overloads. Pump ends have all oil passages machined from solid forged steel blocks. This type of pump is built in capacities ranging from 5,000 to 50,000 bbls. per day against pressures up to 1,000 lbs. The Company builds the complete units, either motor or engine driven.

Due to the rapid spread of electric power lines over the country, many pipe line companies are adopting motor driven centrifugal pumps. The Allis-Chalmers type "M" pump is giving excellent service on a number of lines. This is a double suction, multistage pump of high efficiency, requiring very few repairs.

Motors for driving pipe line pumps of both the centrifugal or the plunger types as well as motors for pumping, drilling and general purpose use are built by this Company. Allis-Chalmers motors have sturdy frames, liberal sized bearings and well insulated windings. They will stand up under hard and continuous service.

The positive and flexible multiple V-belt Texrope Drive is widely used in every branch of the oil industry. Many pipe line companies have chosen Texropes for operating their plunger pumps. Texropes permit the use of higher speed motors with their lower costs and higher efficiencies.

Gas engine driven gas compressors are suitable for use in booster stations on gas lines. The compressor shown above was built for a company operating in California. It operates on and compresses natural gas. Allis-Chalmers has had wide experience in building gas engines and compressors. Many of the largest gas engines in America were built by this Company, a pioneer builder of power, electrical and industrial machinery.



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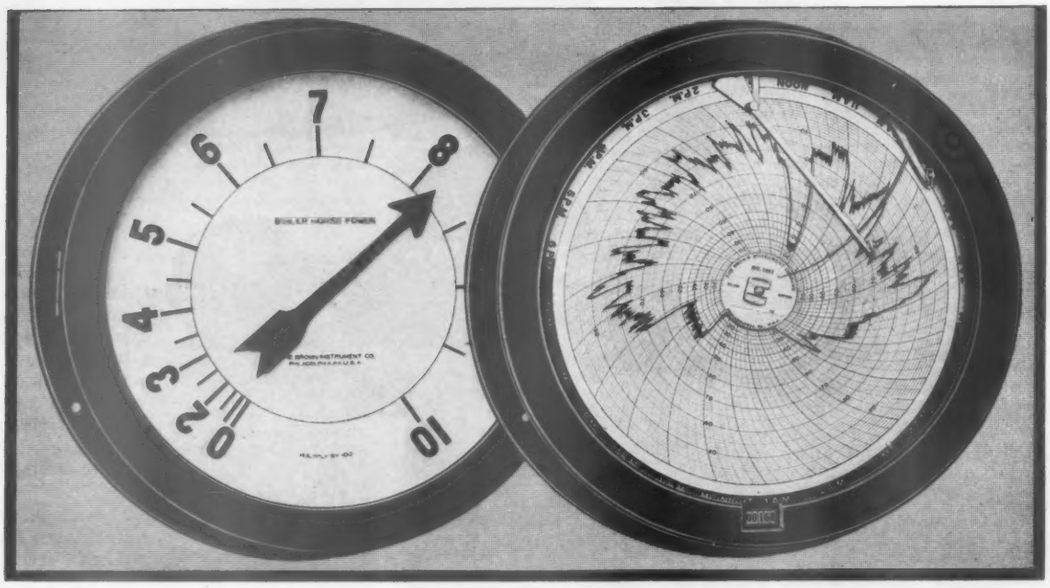

1. Instruments operate at distance from manometer.
2. No bushings or rotating shafts through manometer case.
3. No wires pass through pressure chamber wall.
4. No voltage regulator or compensators needed.
5. Forged Steel Manometer for high pressures.
6. Blow-out check prevents surges from blowing out mercury.
7. Range can be easily, quickly and cheaply changed.
8. Automatic recording planimeter.
9. Instant-reading integrator dial.
10. Double-Range Manometer.
11. Electric circuit completely protected from moisture.
12. Electric system impervious to moisture.
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15. No transformers ordinarily required.
16. Current consumption practically negligible.
17. No bother with clock-winding.
18. Motor-driven integrator.
19. Compact.
20. Small manometer mounts on floor or wall.
21. Large scale—easy reading.
22. Widest scale divisions where needed most.
23. Outfit easily portable.
24. No delicate bearings.
25. Dustproof aluminum case.
26. Easy to install and maintain.

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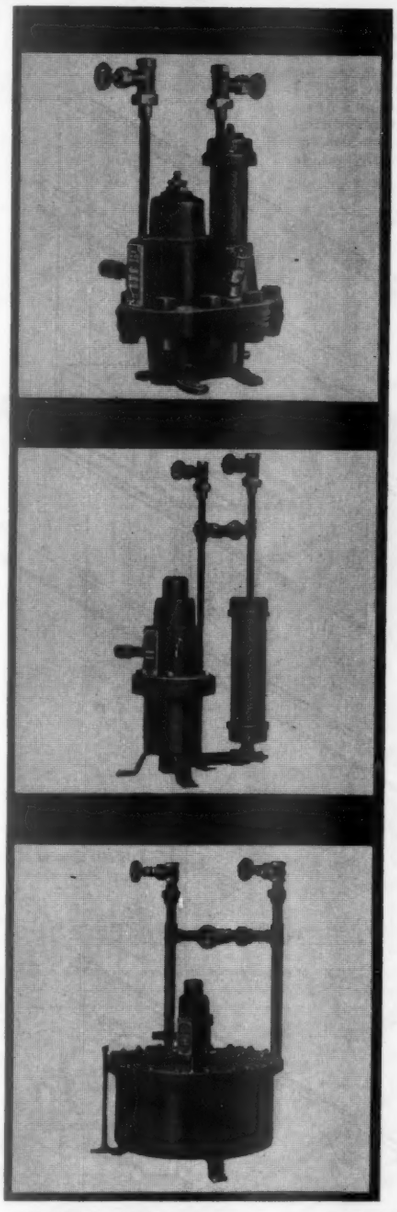
3 Types of Manometers



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Furnished for measuring the flow of any gas, vapor or liquid where a differential pressure across the orifice of 1.6 inches of mercury or over is permissible.

Standard models can be used for any pressure up to 750 lbs. per square inch.

Special models can be supplied for pressures up to 1,500 lbs.

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Furnished for measuring the flow of gas or air where the orifice is designed for a moderate differential pressure and the pressure of the gas to be measured does not exceed 50 lbs. per square inch.

The lowest range gives full scale reading with a differential pressure of 2.17 inches of water, and the highest range gives a full scale reading with a differential pressure of 13.71 inches of water.

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Furnished for measuring the flow of gas or air where the orifice is designed for a very small differential pressure, in order to keep the total pressure drop within reasonable limits, and the pressure of the gas to be measured does not exceed 10 lbs. per square inch.

The lowest range of this manometer gives a full scale reading with a differential pressure of .217 inches of water, and the highest range gives full scale on a differential pressure of 2.17 inches of water.

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Flow Meter *on the inductance bridge principle*

"To measure is to economize"

Diesel Engines in Main Line Stations

Bird's-eye View of the Diesel Engine in Pipe Line Work From the Standpoint of Man in the Oil Field

By R. G. Lewis
Prairie Pipe Line Co.

There have been a great many articles written about the Diesel engine explaining its advantages and making comparisons between this type of prime mover, and the modern steam engine, with its economies for a standard. However, that may be, this article will be confined to uses of Diesel engines in pipe line stations.

The Diesel engine is applicable to every field of power generation in which steam can be used; this includes stationary power plants, like municipal stations, pipe line pump stations, etc., marine and auxiliary installations and locomotives. The use of the Diesel engine for stationary plants is governed entirely by location and special considerations. When the conversion of fuel into power is the consideration the Diesel engine is more efficient than any other known type of power generator.

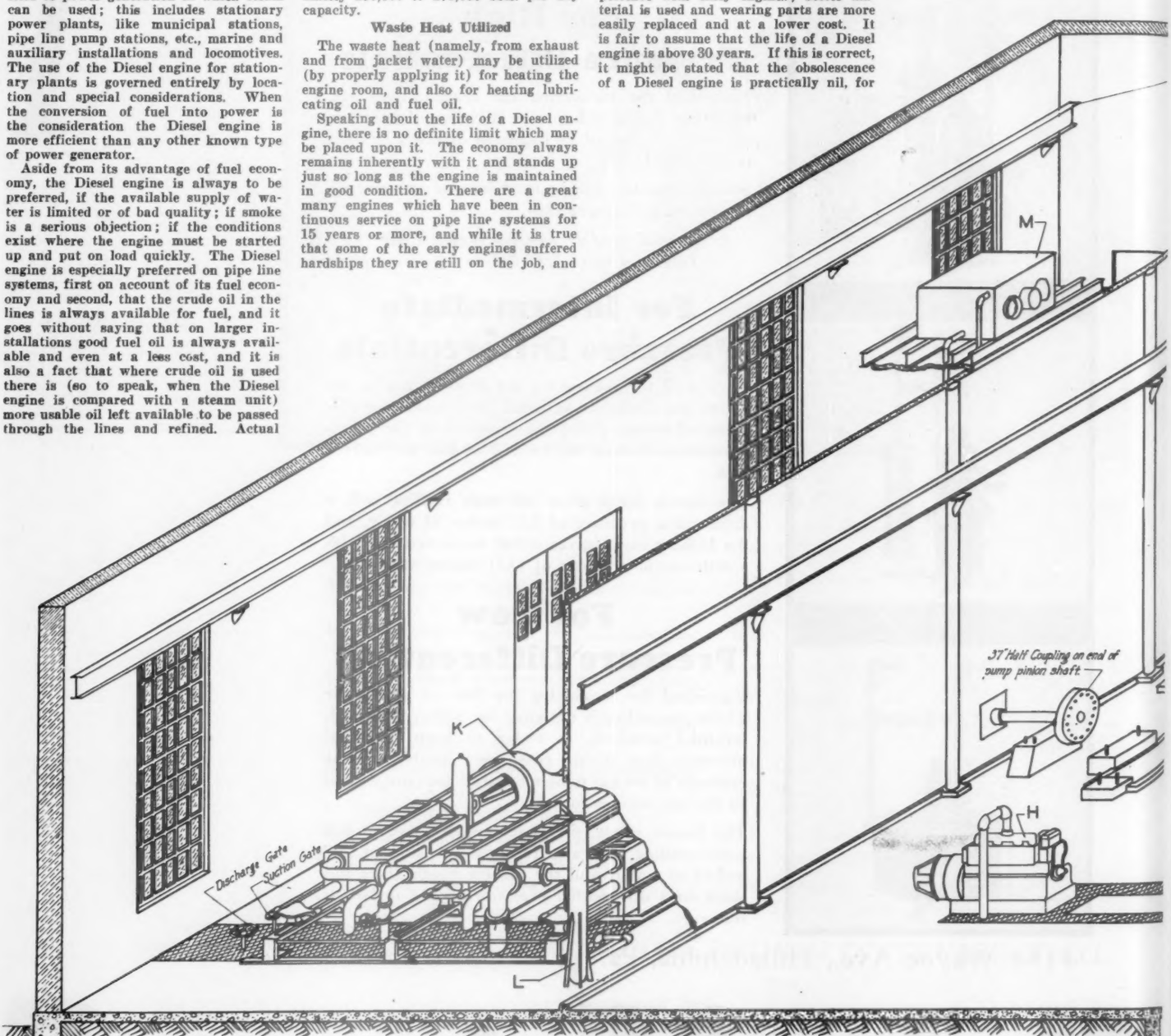
Aside from its advantage of fuel economy, the Diesel engine is always to be preferred, if the available supply of water is limited or of bad quality; if smoke is a serious objection; if the conditions exist where the engine must be started up and put on load quickly. The Diesel engine is especially preferred on pipe line systems, first on account of its fuel economy and second, that the crude oil in the lines is always available for fuel, and it goes without saying that on larger installations good fuel oil is always available and even at a less cost, and it is also a fact that where crude oil is used there is (so to speak, when the Diesel engine is compared with a steam unit) more usable oil left available to be passed through the lines and refined. Actual records on a large pipe line system show that the fuel consumption on a Diesel engine, compared with a triple expansion steam pumping unit, is in the ratio of 1 to 3½, and in many cases 1 to 4. This means on the same pipe line system (in the case where crude oil only is used for fuel) that there is a saving of approximately 200,000 bbls. of crude oil per year on a system having approximately 150,000 to 175,000 bbls. per day capacity.

Waste Heat Utilized

The waste heat (namely, from exhaust and from jacket water) may be utilized (by properly applying it) for heating the engine room, and also for heating lubricating oil and fuel oil.

Speaking about the life of a Diesel engine, there is no definite limit which may be placed upon it. The economy always remains inherently with it and stands up just so long as the engine is maintained in good condition. There are a great many engines which have been in continuous service on pipe line systems for 15 years or more, and while it is true that some of the early engines suffered hardships they are still on the job, and it is also a fact that some of these early engines were of the semi-Diesel type. A great number of the latter have been transformed to conform more with the modern engines, namely from semi-Diesel type with air injection to "solid injection" type; from open type nozzle to closed type.

The Diesel of today is built in accordance with information gained from experience with early engines; better material is used and wearing parts are more easily replaced and at a lower cost. It is fair to assume that the life of a Diesel engine is above 30 years. If this is correct, it might be stated that the obsolescence of a Diesel engine is practically nil, for it is not at all likely that Diesels will become obsolete within this time, namely; 30 years. In contrast with other types of engines, such as the modern steam engine or steam turbine, the efficiency of a Diesel engine does not fall off and this statement explains itself as follows:



A—600 H.P. Diesel Oil Engine.
B—35 K.W. Generator.
C—10 G.P.M. Lubricating Oil Separator.
D—1½ and ¾ Rotary Pumps for handling fuel and lubricating oils.
E—Motor Driven Vertical Centrifugal Sump Pump.
F—Foundation for 35 K.W. Generator.
G—Foundation for 600 H.P. Diesel Oil Engine (omitted to show other equipment).
H—60 H.P. Diesel Electric Auxiliary Unit.
J—3" Motor Driven Centrifugal Water Pumps. (Either pump having sufficient capacity for total cooling water required.)
K—6½x36 Horizontal Triplex Power Pump (capacity 35,000 barrels).
L—Air Alleviator for discharge line.
M—Heat Radiating Unit for Engine Room.

BASEMENT

N—Lubricating Oil Cooler.
P—Lubricating Oil Filter Tank.
R—Lubricating Oil Heater.

The main frame of an oil engine is of necessity of rugged design; therefore, with valves and piston rings kept tight, the full cylinder compression will be maintained and the fuel charge will be as well burned in an old engine as in a new one. It is necessary at times to install new liners and pistons to maintain original clearances. It is, therefore, a simple matter to maintain an engine and hold its efficiency.

The upkeep on modern engines is lower than on the early types. This in part is due to using better and more adaptable materials, which have improved the design. Another item which has helped the Diesel engine is very well expressed by an experienced engineer on one of the pipe line systems. He relates "that what has happened in these pump stations is the fact that we have taken boys off the farm and made good engineers out of them, who keep our engines running."

The recovery of the heat in the exhaust gases and the cooling water may be accomplished with exhaust gas heaters, and the utilization of the hot water from the jackets. This latter item may be carried out to the extent of installing sleeves on the exhaust lines. Both of these items will tend to increase the overall thermol efficiency.

Pipe Line Operation

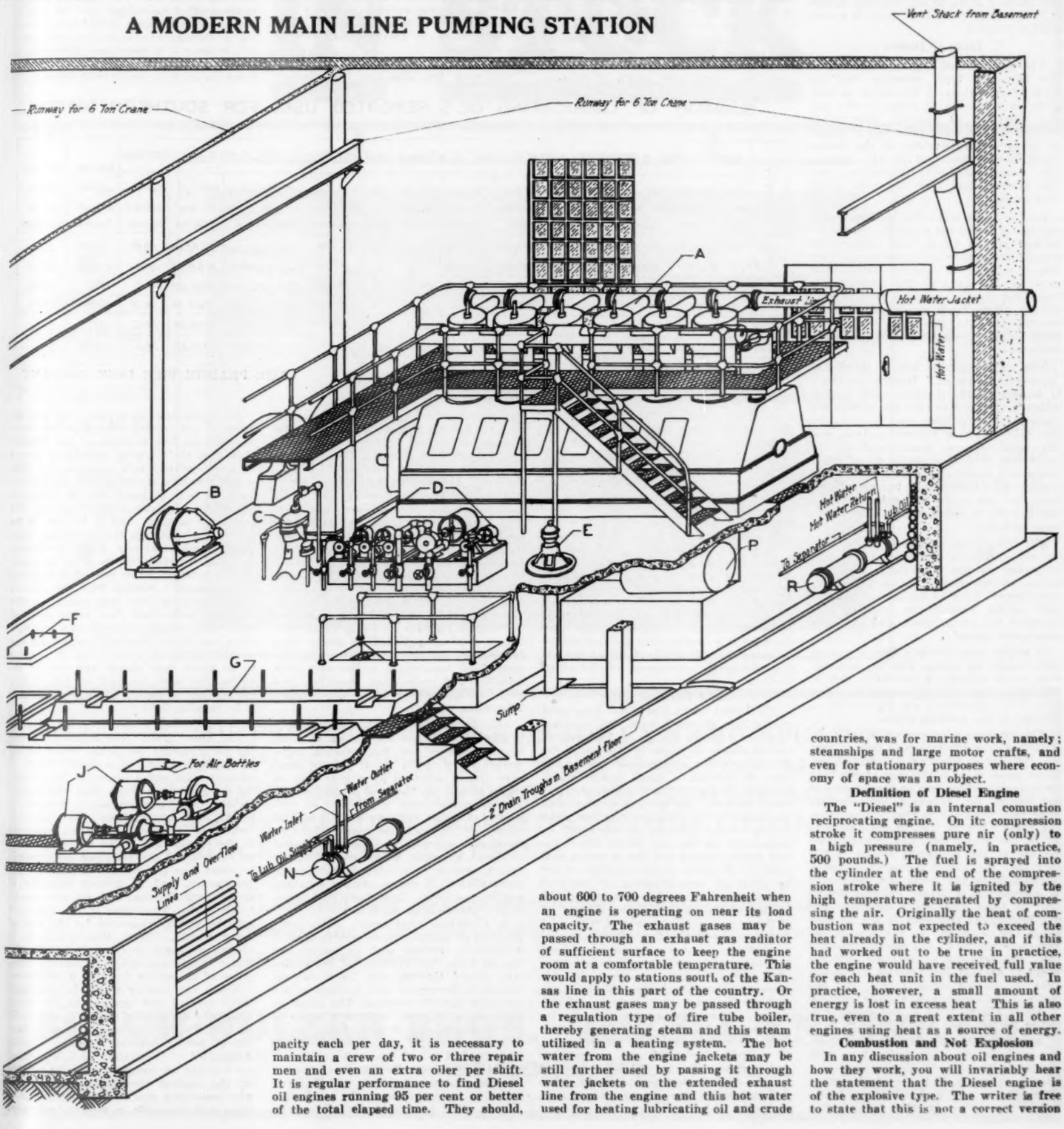
Considering for the moment the operation of a large pipe line pumping station, a chief engineer for supervision and one capable of making engine adjustments; an operating engineer; an oiler and a telegraph operator per shift, and where there are a multiple number of units, say, up to six of 35,000 bbls. capacity each per day, it is necessary to maintain a crew of two or three repair men and even an extra oiler per shift. It is regular performance to find Diesel oil engines running 95 per cent or better of the total elapsed time. They should, however, be shut down at regular intervals and be inspected and necessary adjustments and repairs made.

It is good practice to overhaul an engine completely once a year. The average yearly cost of parts to maintain an engine in good condition should fall within 2 or 3 per cent of the cost of a new engine. The maintenance expense on an engine is largely dependent on an engineer's attention to the small irregularities which if promptly observed and corrected will prevent more serious troubles.

Of the total amount of heat value in the fuel burned in a Diesel engine, the exhause gases take away about one-fourth and the cooling water about one-third. In actual practice there is about 50 per cent of this rejected heat which may be utilized by comparatively simple methods. The exhaust gases leave the engine at about 600 to 700 degrees Fahrenheit when an engine is operating on near its load capacity. The exhaust gases may be passed through an exhaust gas radiator of sufficient surface to keep the engine room at a comfortable temperature. This would apply to stations south of the Kansas line in this part of the country. Or the exhaust gases may be passed through a regulation type of fire tube boiler, thereby generating steam and this steam utilized in a heating system. The hot water from the engine jackets may be still further used by passing it through water jackets on the extended exhaust line from the engine and this hot water used for heating lubricating oil and crude oil. Lubricating oil is heated to facilitate separation before passing it through a centrifuge; crude oil is heated for the same reason. Fuel oil supply lines may be heated by hot water from exhaust sleeves.

The first successful engine built for the inventor was of the vertical type, single acting four-cycle (with trunk piston). It is history, however, that a great many of the first engines were of horizontal design, and the same thing may be said about the development in the United States. However true this may be the vertical, or marine type, soon wedged its way into place and is admittedly the engine of today, and in passing this item, it might be well to state that the development of marine multi-cylinder engines was a natural one, because its first application, in foreign countries, was for marine work, namely; steamships and large motor crafts, and even for stationary purposes where economy of space was an object.

A MODERN MAIN LINE PUMPING STATION



Definition of Diesel Engine

The "Diesel" is an internal comustion reciprocating engine. On its compression stroke it compresses pure air (only) to a high pressure (namely, in practice, 500 pounds.) The fuel is sprayed into the cylinder at the end of the compression stroke where it is ignited by the high temperature generated by compressing the air. Originally the heat of combustion was not expected to exceed the heat already in the cylinder, and if this had worked out to be true in practice, the engine would have received full value for each heat unit in the fuel used. In practice, however, a small amount of energy is lost in excess heat This is also true, even to a great extent in all other engines using heat as a source of energy.

Combustion and Not Explosion

In any discussion about oil engines and how they work, you will invariably hear the statement that the Diesel engine is of the explosive type. The writer is free to state that this is not a correct version

of what takes place in the cylinder of the engine, which one will understand from the following: when pure air is compressed up to a pressure of 500 pounds the temperature rises theoretically to about 2,600 degrees Fahrenheit (in actual performance it is found that this temperature is well below 1,600 degrees.) When a highly vaporized fuel (almost gasified) is injected into the cylinder, (when the piston is at the beginning of the working stroke), it automatically ignites and burns and provided this injection is timed at the right point the pressure in the cylinder does not rise above 500 pounds and it does its work by maintaining for a short interval of time a constant pressure in the cylinder (of 500 pounds) and does further work by expanding adiabatically; it may thus be understood that if the performance of the burning gases in the cylinder agrees with this description that there is no explosion present.

Types of Diesels

The early Diesel engines were all of the four-cycle type, meaning that the cycle of operations of the piston is complete on every fourth stroke of the piston, described as follows: The piston receives one impulse, or working stroke, in every two revolutions of the crankshaft, briefly described as (1) suction, (2) compression, (3) expansion, and (4) exhaust, and then the cycle starts over again.

A-1, A-2 and A-3—The modern Diesel engines of today are made in the single-acting type to fairly large sizes using a multiple number of cylinders, and still larger engines of greater horsepower capacity are made in the double-acting type, and in this case it is necessary to use a piston and crosshead type of construction. In this type, engines of 4,000 brake horsepower capacity are quite common.

The same may be stated about the "opposed type piston." Briefly, the latter is known as the Junkers type engine, which is arranged so that the pistons are opposed to each other and the combustion takes place in between pistons, and the work done is transmitted to the crankshaft through a double set of crossheads and connecting rods. This is the engine which theoretically has no cylinder head, and the intake and exhaust valves are located in ports on the side of the main cylinder.

(B) Two-cycle—In the two-cycle type the piston receives one impulse for every revolution of the crankshaft. The two cycles, or movements, of the piston are as follows: (1) working stroke (exhaust and intake happens at end of this stroke); (2) compression, and the cycle starts over again.

It might simplify one's idea of a two-cycle engine by stating that the performance in the cylinder is similar to that in the four-cycle, with the exception that two of the operations are hurried up at the end of the working stroke.

The apparent advanges which the four-cycle has over the two-cycle type is that the cylinder is more nearly clear of exhaust gases than in the case of the two-cycle engine where two or the operations are hurried up. However, later engines have been designed so that the scavenging takes place as well in the two-cycle as in the four-cycle. The objectionable feature of the four-cycle engine is the fact that the piston makes two strokes without doing any work, and the engine is necessarily of larger cylinder design for the same horsepower capacity, and the mechanical efficiency is not as high as in the two-cycle. In the case of the two-cycle engine it was always expected that the capacity of a given cylinder could be doubled, but practice has shown that this is not actually true, and the ratio of the capacity of a given cylinder is about 1½ to 1, or in any event it is below the expected 2 to 1.

As described above, two-cycle engines are made in the single-acting type with multicylinders up to larger capacities than is possible with the single-acting, four-cylinder type, and still larger horsepower capacities in the double-acting type, and the same made be said about the opposed piston type.

Injection Systems

(A) Air injection: Closed type of fuel valves—The chief functions of the fuel valves in any engine are: First, to introduce the fuel into the combustion space at the correct instant; and, second, that of dividing the fuel into minute particles, or in fact almost gasifying it, and in the closed type the fuel valve stem opens at near top center and permits the air blast to thoroughly atomize the fuel charge which has been delivered to the fuel valve by the fuel pump, and when this injection is complete the valve closes and separates for the instant the injection system from the cylinder.

(B) Air injection: Open type of fuel valve—In the case of the open type, the valve stem operates on the air only, and delivers the air which picks up the charge of oil which has been deposited in a cavity and passes it through the atomizer and into the engine, and the difference in these two types of nozzles lies in the fact that the "closed type" shuts off all contact of the pressure of the cylinder from the atomizer after injection, and in the case of the open type the air valve is back of the atomizer and the charge of fuel oil in the atomizer has consequently been exposed to the cylinder pressures just before the air injection. This is an objectionable feature in the open type of fuel valve. The open type works well up to a little better than one-half load, and beyond this it usually does not function properly without using extremely high air pressure. In the closed nozzle there is a better opportunity for atomization to take place because the air and fuel are mingled before entering the cylinder, whereas in the open type nozzle there is a tendency for the fuel charge to enter the cylinder in front of the air injection giving consequent inferior atomization.

Solid Injection Type

(C) Direct pump injections: Very good results are obtained with the so-called injection type of spray or fuel valves, and in almost all types of this nozzle the atomizing effect by means of passing the fuel oil through a small nozzle which contains an atomizer and a comparatively small opening. The spray is accomplished in general by direct pump injection. The timing of the injection is controlled by adjustment on the cam which drives the fuel pump plunger and the governor controls the duration of the injection, either by short or long stroking of the fuel pump plunger, or by controlling the seating of the suction valve. Almost all of the present engines equipped with solid injection spray the fuel oil into a precombustion chamber where a part of the fuel burns and creates a still higher pressure and a violent turbulence in this chamber before the balance of the atomized fuel reaches the working cylinder proper. The advantage of the solid injection is due to the fact that a multistage air compressor, with all its valves, is entirely eliminated and so are the rocker arms and cams which are required for the air injection type of nozzle. The fuel economies are almost identical as compared with the air type of nozzle and it is safe to say that the exhaust temperatures are found to be somewhat lower.

Some of the later engines using solid injection are not equipped with pre-combustion chambers, and this becomes possible by resorting to extremely high injection pressures and using consequent smaller openings in the nozzles. In this type any special atomizers inside the nozzles are not necessary for the reason that the small aperture accomplishes all of the atomizing.

(D) Constant pressure type: This type of injection differs from the one just described due to the fact that a fuel pump in this case maintains a constant pressure on the fuel lines and the oil is admitted through the nozzle, by means of a timing device under the control of the governor. Therefore, this type of nozzle requires to be cam-operated and it is necessary to use a balanced needle valve in order that the governor may control its movements.

Conversions

One pipe line company has changed 28 engines over from semi-Diesel type to solid injection type. These were 100 horsepower engines having a compressor and a combustion chamber. These engines have given excellent service.

Lubrication Systems

(A) Gravity and splash: All early engines of the vertical or horizontal type were equipped in general with gravity lubrication, or a combination of gravity and splash lubrication. This was accomplished in the usual way by having oil cups or a gravity line leading to the engine and to all the lubricating points and supplying all of the rotating and reciprocating parts with oil. However, the delivery of cylinder oil going to the cylinders was accomplished by means of a forced-feed lubricator. The gravity method of lubrication, unless very well installed and maintained, does not give very satisfactory results and wastes lubricating oil.

(B) Forced feed: This system may briefly be described by stating that all of the rotating and reciprocating parts receive their supply of oil from a pressure system actuated by a gear type of pump located in the base of the engine, and by maintaining a pressure on this system all parts are assured of a copious supply of oil with the result that the bearings run on oil and are never metal to metal, as might be the case with the splash system. Cylinder lubrication is accomplished, of course, with a separate, and in most cases, timed force feed pump.

(C) Purification methods:

1. Chemical reclaiming: The early practice of manufacturers was to furnish a filter or strainer with an engine and the oil from the crankcase of the engine was passed through this filter and returned to the engine, with perhaps a supply tank located overhead. The result of using such a system leads to a waste of lubricating oil and it is necessary to renew the oil supply at frequent intervals. This method would strain the oil but it would soon become discolored and contain a great amount of carbon which it collected in passing through the lubricating system. The next method used to quite an extent was the reclaiming of the oil by chemically treating it with soda ash in the so-called oil reclaimer, and very good results are obtained with this equipment. However, if the reclaimer is not systematically used, it also wastes oil.

2. Centrifuge: The best system for clarification of lubricating oil and the one coming into most general use, especially for large stations, is by the centrifuge process. Its operation is continuous and requires but very little attention, and it is to be noted that it furnishes at all times, a clean oil to the system, and it also takes care of removing any moisture which might accidentally collect in the lubricating circuit. The centrifuge might not clear up the oil so that it has its original color and transparency, but it does effectively clean and does not waste oil. The capacity and effectiveness of centrifuge may be greatly assisted by preheating the oil before passing it through the separator, and when this is done it is sometimes necessary to install heat exchangers in order to cool down the oil to a usable temperature.

SUMMARY OF LUBRICATING OILS REPORTED USED FOR SOUTHERN DIVISION 1929

MONTH	MAIN LINE STATIONS				GATH'G LINE STATIONS				BOOSTERS		TOTALS FOR ALL STATIONS				Total No. Gallons Dirty Oil Treated	Total No. Gallons Lub Oil Reclaimed
	No. of Sta's	Total Daily Av. Pumped in Bbls.	Total Lub. Oil Used in Dollars	Cost Per 1000 Bbls Pumped	No. of Sta's	Total Daily Av. Pumped in Bbls.	Total Lub. Oil Used in Dollars	Cost Per 1000 Bbls Pumped	No. of Sta's	Total Lub. Oil Used in Dollars	No. of Sta's	Total Daily Av. Pumped in Bbls.	Total Lub. Oil Used in Dollars	Cost Per 1000 Bbls. Pumped		
JAN.	18	873319	1902.12	7.0	78	259146	1738.06	21.6	7	54.84	103	1132545	3640.18	10.4	1564	1103
FEB.	18	840901	1833.75	7.8	79	244946	1326.58	19.3	3	16.58	100	1085847	3160.33	10.4	1123	925
MCH.	18	854287	2001.89	7.6	80	248057	1489.73	19.3	1	8.45	99	1102344	3491.62	10.2	1316	1004
APR.	18	887520	2120.24	7.9	79	238248	1449.55	20.1	1	17.10	98	1125768	3569.79	10.5	1328	946
MAY	18	893616	2378.87	8.6	80	222000	1261.37	18.3	2	1062	100	1115616	3640.24	10.5	1227	918
JUNE	18	956270	2566.31	8.9	81	240540	1253.17	17.4	2	12.52	101	1196810	3819.48	10.6	1028	827

THE PRAIRIE PIPE LINE COMPANY

Note—The cost per thousand barrels pumped, is in cents.

Accompanying is a very interesting table of lubricating oils reported used on 18 main line stations of the Prairie Pipe Line Co.'s system covering a period of six months, which duration of time should result in obtaining very good averages. It is to be noted that the averages are fairly consistent, especially on the main line stations, and it is also to be noted that although the gathering lines show a comparatively high lubricating cost per thousand barrels of oil pumped, that in most all cases this oil is handled twice, namely: coming into the station through gravity lines and resting in the working tanks, and then being pumped out. This usually requires two separate units, one on the "suction" pump and one on the discharge pump; and it is also to be noted that almost any engine requires the same amount of lubricating oil whether it carries a load or whether it be running light.

Cooling Water Systems

(A) Open type: The regulation cooling water system for jacket water on an oil engine consists of a supply tank of adequate size and a reservoir into which the cooling water flows from the engine jackets, and the necessary pumps to handle the water from the reservoir (where it is cooled) and then returned to the supply tank. The minimum limit on the size of the reservoir corresponds to about 8 or 10 barrels (42 gallons) per horsepower, and of greater capacity if used where the temperatures are consistently high. The value of the reservoir may be greatly improved by the use of spray nozzles. With this system it is always necessary to treat chemcially the water supply and keep the scaling properties of the water down to a minimum.

When the cooling water is systematically treated and brought to the point where the scale found on the engine jackets is at a minimum there is no more danger of having cracked cylinder heads. Almost all of the waters in this part of the country are being successfully treated by the various chemical manufacturers who make it a point to study the conditions and prescribe a proper treatment

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WORKS ST. LOUIS

FAVORABLY LOCATED FOR QUICK SERVICE

A LARGE PERCENTAGE OF REPLACE PARTS SHIPPED SAME DAY ORDER IS RECEIVED

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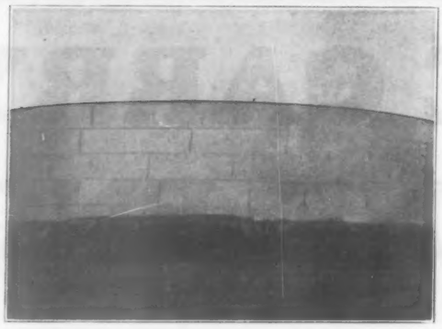
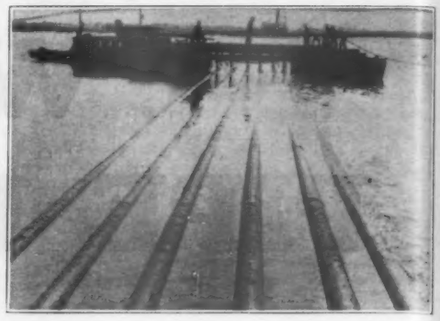
"I see now how you are able to start shipping as soon as you get the order and to follow up with shipment of two engines per week."

BUSCH-SULZER BROS.—DIESEL ENGINE CO.

ST. LOUIS, MO.





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METAL buried in the ground is bound to be wet or moist part of the time. If it is wet with NO-OX-ID, it can't be wet with anything else. NO-OX-ID and NO-OX-ID-IZED Wrapper keep the metal surface wet with NO-OX-ID while the outside of the wrapper forms an air tight and water tight seal. The improvements developed enlarge the range of conditions we can handle, increase the life of the protection, and reduce cost of application.

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The Dearborn Chemical Company is now in a position to furnish three classes of wrapping materials.

(1) Our cloth NO-OX-ID-IZED wrapper which has been on the market and proven its worth under a wide range of conditions.

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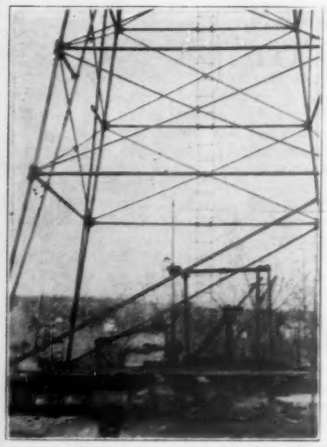
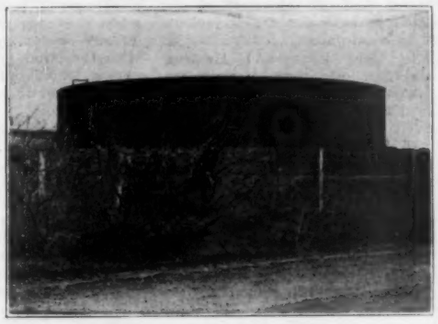
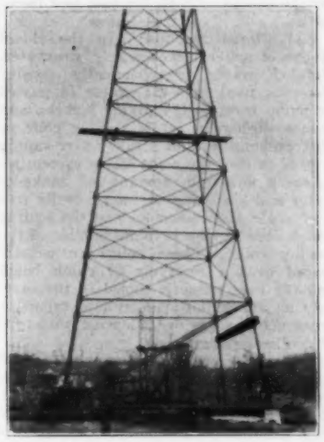
The Original Rust Preventive







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Two new consistencies of NO-OX-ID have been developed for pipe line work based upon the experience of ten years' actual service.

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for the water and maintain this service for the benefit of both the user and themselves.

(B) Closed systems: In the closed system of water jacket supply, rainwater, distilled water or chemically treated water is used and the water is passed by pump through the engine jackets, and thence through a set of cooling coils or heat exchangers, and a raw water supply is used to cool the coils. This system requires a minimum amount of make-up water and keeps the engine generally free from scale and corrosion, and the scaling which does happen is found outside of the cooling coils. These coils are usually placed over a reservoir or catch basin and the raw water is cooled in the same way as under the open system type. A great many users are adopting this type of cooling system.

On smaller engines, or even up to 100 horsepower or better, radiator systems may be used by having the required amount of cooling surface available and a necessary amount of air passed through the radiator. Another method utilized by one pipe line company is to pass the crude oil in the lines through a heat exchanger and circulate the jacket water through the engine into the heat exchanger and back to the engine again, perhaps utilizing a small surge tank. This latter system also requires a minimum amount of make-up water.

Fuel Oil

Qualities necessary and prohibited.

(A) Fuel Oils from Refineries. — The fuel oils available at the present time are of lower specific gravity than what one has been familiar with in the past, and in selecting a fuel oil one should consider, first, the gravity and flow test and the sulphur content, also the moisture content, and if possible the dirt content. The fuel oil a few years ago was of a higher gravity and was readily burned in engines and did not give any bad results. However, later methods in the refineries have changed the characteristics of fuel oil, and it has become necessary to consider cleaning the fuel oil with a centrifuge before trying to abuse a good engine with it. In one instance, at a station having at least 150,000 bbls. capacity and burning about 50 to 60 bbls. of fuel oil a day, when a centrifuge sepator was used, the dirt accumulation was found to be close to 22 pounds a day, or to be exact, at the rate of about 8,000 pounds a year. This dirt collected consisted principally of coke, carbonized oil and some moisture, and one would readily agree with the fact that such fuel could not possibly give very good results if used without cleaning. It would mean fouled spray valves and consequent trouble with exhaust valves and worn cylinder liners.

(B) Crude Oil.—One of the difficulties encountered in using crude oil is the same as just described except that the dirt found consists of sand and pipe mill scale ,and in many cases crude oil causes just as much trouble as fuel oil. When using crude oil a good installation is realized by having two separate fuel tanks with cone bottoms, equipped with heating coils, so that each tank may be heated, especially in the winter time, and allowed to settle, the tanks, of course, being utilized alternately.

Conclusions—Development of Details

A few of the details which have helped to bring the modern Diesel engine up to date are tabulated herewith:

1. General tendency toward conservative design. (A) Larger cylinder diameters than formerly used for a given horsepower. This reduces the mean effective pressure necessary to carry a given load and a lower mean effective pressure means a less heat quantity to be handled in a given cylinder to give the horsepower capacity. (B) Larger crankshafts and bearings.

2. Forced Feed.—Using forced feed lubricating systems on main bearings and all rotating and reciprocating parts causes the working parts to run, so to speak on oil and not on metal, besides eliminating to a great extent the use of the oil "squirt" can.

3. Cooling Systems.—This implies the using of the best cooling system adaptable to the conditions which may obtain.

(A) Proper chemical treatment of the water so that scale in the engine jackets is reduced to a minimum.

4. Waste Heat Uses—(A) Heating lub oil and fuel oil; these items were outlined above. (B) Heating building; also outlined above. In passing on these two items, it may be said that they all tend toward increasing the overall efficiency of any Diesel engine unit.

5. Trained Operators.

First-Class Men Needed

It is necessary on any station equipped with Diesel engines to have first-class men who are alert and understand the responsibilities entrusted with them. It is not required that these men be experts. They just should be of the right caliber to catch on easily and improve themselves by experience. There is no hardship presented in operating a Diesel engine.

6. Increased Speeds in Certain Types —There is a tendency toward increasing what was known as the old-time standard for piston speed. This has come about through experiences with marine types of engines which are usually designed to operate at high speed. The reciprocating parts are made lighter and the shafts are made heavier, and it is probably a fact that no bad experiences have been encountered when the design of the engine corresponds to the speed at which it operates.

7. Centrifuges—(A) Lub Oil: Centrifuging lubricating oil with a properly designed centrifuge has greatly improved lubricating oil systems wherever used. (B) Identically the same might be said of fuel oil, only in this case better spray valve performance is realized and consequent improvement on both exhaust valve performance and also eliminating wear on cylinder liners and on pistons.

8. Air Filters—The air filter applied to the intake line at once gives good results which are at first evident by finding the oil in the crank case of the engine to be much cleaner than when a filter is not used, and besides that it is very understandable it is better to use clean air than it is to use air laden with dust and dirt.

9. Wear on Cylinder Liners—When the fuel oils to an engine is centrifuged and an air filter is applied to the intake line, there is quite a noticeable difference in cylinder liner wear; in round numbers, the wear on the cylinder liner taken from a number of records on the Prairie Pipe Line system over quite a period of time, is clese to one one-thousandth of an inch per month, and where neither the centrifuge nor the air filter is used, the wear is at the rate of nearly two one-thousandth of an inch per month.

Points in Operation

10. Pyrometers—Electrical pyrometers applied to the exhaust outlet on each cylinder in a station give a direct clue to a change of performance of the engine when a change of temperature shows up on any one cylinder which is out of line with the other cylinder on the particular engine tested, and the operator may decide whether it is spray valve or exhaust valve trouble by making certain tests

11. Valve Setting and Cam Clearances—Correct valve settings and proper clearances between rocker arm rollers and cams keep an engine in tune and permit the engine to carry its regular load with facility. One has in mind what results are obtained when you tell an automobile mechanic to tune up your engine. You immediately notice that the engine runs more smoothly and has more pep, and the same thing goes for the Diesel oil engine.

12. Special Piston Rings—The usual ring to use on a piston is known as the snap ring or bevel jointed ring. These rings work well when the liners and pistons are not badly worn, and it has developed within the past few years that a two-part piston ring could be used to good advantage on any piston where the wear of the liner had exceeded unusual limits. These rings, usually two on each piston, are placed in the third and fourth grooves from the top where they are protected somewhat from the high temperature which exists near the top ring. The immediate result of using these rings which conform themselves to the shape of the liner throughout the stroke, is the diminishing of smoke in the crank case, which goes to show that the rings do not leak. A tight piston ring helps keep a piston cool and a leaky piston ring causes a piston to heat.

13. Chromium Plated Parts—Where the fuel oil carries a sulphur content or any other corrosive, the chromium plating of these parts will remedy the trouble, and chromium plating has a special application to fuel pump plungers for the reason that it has a lower coefficient of friction when compared with other metals. It is therefore easy to keep the stuffing box tight provided the pump uses a stuffing box. Chromium plating applies to spray valve parts, fuel pump valves and fuel pump plungers. Of course, the stainless steel plungers and other types of acid resisting steel plungers have always been available.

14. Log Sheets—Log sheets have given very good results for several years, and helped the engineer to make his records with the least exertion possible. These are kept daily by the engineer, only one log sheet for each engine, and on the same type of sheet a summary for the month is made out by the engineer and mailed to the office. In this way the records are evident without having to search through a whole month's records. You will also note that it is not always necessary for the engineer to do any writing, and where there are a number of engines in a station this item saves time and helps to keep the log sheet clean.

Oil trunk pipe line pumping station.

Diesels on Pipe Lines

The Prairie Pipe Line Co. operates a total of better than 75,000 horsepower in Diesel oil engines on its pipe line system. This includes main line and gathering line stations. Very few people, except those in direct touch with pipe line syetems, realize that there is an estimated total of 250,000 horsepower in Disel engines on pipe line systems in the Mid-Continent fields, and, of course, extending to the Gulf and West Texas and Panhandle fields, and main lines as far north as Fort Madison, Iowa. These engines vary from the small horsepower capacities up to engines of 800 horsepower capacity.

The total number of main line stations on the Prairie Pipe Line Co.'s system equipped with Diesel engines is taken as 28, and there are 7 stations which are still equipped with the original steam units, which are triple expansion steam pumping engines.

The accompanying pseudo-perspective drawing shows a recent addition to the Prairie Pipe Line Co.'s Panova station near Shawnee, Okla. This addition consists of two 600-horsepower Diesel oil engines which are each direct connected to 6 by 36 triplex power pumps each having a capacity of 35,000 to 40,000 bbls. a day. The reader will note that the equipment in this addition is quite complete and that all the details have been carried out that go to make a modern station. This perspective drawing was made by B. C. Roby.

On this system there are many engines which have shown 99 per cent continuous operation, and in several cases in particular engines have operated for 400 days consecutively with only a few shutdows made to examine some particular detail which could not be inspected while the engine was running, and even then the engine was good for a still further continuous run. This item just goes to show that the improvements which the manufacturers have accomplished on Diesel engines have placed them at the point which warrants the use of oil engines for almost any kind of service imaginable.

Repairing Babbitted Bearings

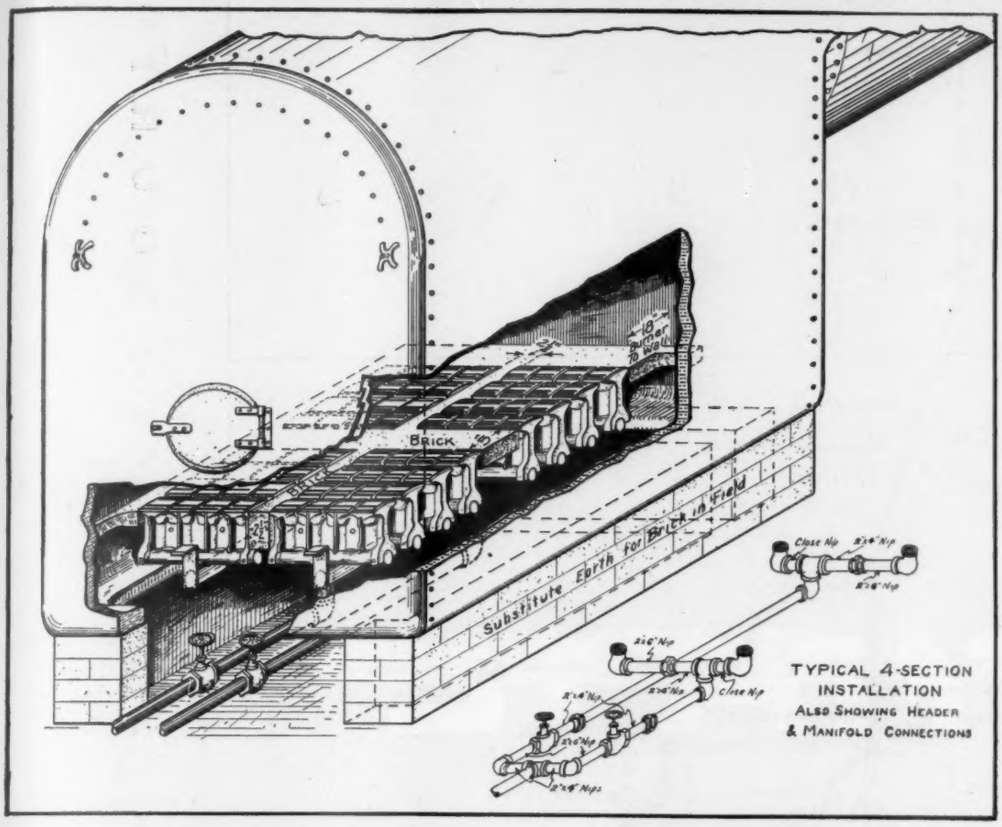
Bearings which are worn so that no further adjustments can be made, or bearings which are burned out, are easily repaired by rebabbitting them. In accordance with old practice the shells were grooved and dovetailed. This was done in order to hold the babbitt in place so that it would not become loose. However, later practice has developed the fact that bearing shells should be well tinned and the babbitt metal poured at the proper temperature, corresponding to the metal used. In this case a good bond is established between the shell and the tin, and in turn, between the tin and the babbitt. The grooving of the shells still holds as good practice.

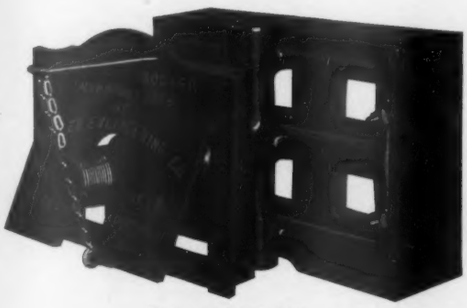
Crankshafts

Crankshafts should be checked systematically in order to know that the shaft is level and resting correctly in each bearing. One of the best methods used to check a shaft is to caliper with tin gauge micrometers the distance between the webs in two places, one out near the pin and the other near the main bearing journal. This is done on each crank throw and these measurements are taken with the shaft usually in four different positions, namely, on top center, bottom center and each side center, and when these measurements vary for the different positions of the crank shaft, it is quite easy to determine which bearing is out of position and the bearing may then be adjusted to bring it back to its original position.

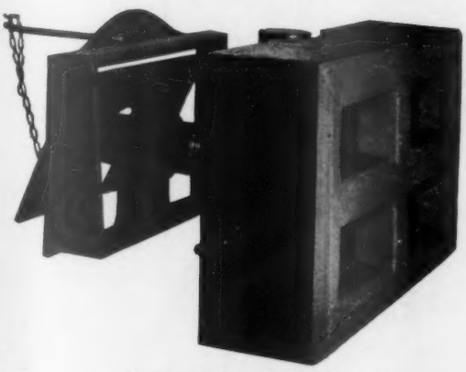
The purpose of this article has been to present to the reader a bird's-eye view of the Diesel engine from the standpoint of a man in the oil field. Such a subject, of course, necessitates the skimming over a great many details about engines as well as the leaving out of technicalities, and it is the hope of the writer that the article may reveal some of its details and indicate the extensive use of Diesel type oil engines in the oil field.

SECTIONAL VIEW TYPICAL INSTALLATION





Front and Side View



Furnace Side and Side View

WENDT

Low Pressure GAS BURNER for Power & Heating Purposes

THE installation of this burner is applicable to all types of heating boilers. The front of burner block is placed flush with furnace wall and the frame with draft door flush with the front wall.

Designed to meet the requirements of natural gas consumers for heating and power purposes where low pressure gas only is available. Although the burner will operate on several pounds of pressure, if sufficient draft is available, it is more satisfactory to operate on a few ounces.

This burner is made up into units of 25 H.P. each. That is, each unit will develop 25 H.P. on 2 oz. gas pressure at the burner. It will develop considerable overload if more gas pressure is available, but on all low pressure installations, enough burners should be installed to carry the load on 2 ounces. The overload is then taken care of by the excess pressure available.

Hundreds of satisfied customers recommend these burners. Clip the coupon and mail to us, with the information requested about YOUR Boilers. We will be pleased to assist you in the selection of the correct size and type burner to meet your particular requirements. We have an interesting sales plan to offer distributors of Wendt and Donner burners, write to-day about your territory.

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Low Pressure GAS BURNER for Oil Field Boilers

THIS burner is a modified Bunsen type with several added features which makes it superior to others of similar design. Provision is made for secondary air; the top is curved to prevent scale and rust accumulating on it; a minimum amount of material is used, yet it is sufficiently strong to withstand rough handling; the mixer tube is designed with bell-shaped opening, and the ports are of such size and shape as to prevent backfiring.

The gas manifold is made of ¾" pipe welded on a 2" header. The ends of ¾" pipe are closed with caps which may be removed and manifold thoroughly cleaned when necessary. The jet size and mixer tube are of such design that, with a slight draft in the firebox, the correct proportion of air and gas is maintained through a wide range of pressure. The momentum of gas issuing from the jet automatically injects the proper amount of air, and with the damper set for average load conditions, good combustion is assured at all times.

On rotary drilling jobs where four boilers are used, each boiler is equipped with two 8-unit sections. Where three boilers are used, four 5-unit sections are installed in each boiler. Cable tool boilers usually require two 8-unit burners. For lease boilers and those used in gasoline plants, it should first be determined what the load of the boiler will be and then enough units installed to properly handle this load. The approximate requirement is one unit per 6 boiler H.P. For example, a 90 H.P. load would require fifteen units. In such case, sixteen units or two 8-unit sections, should be installed. Our standard field burners are made up into 5, 6 and 8-unit sections.

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Address.....
Make of Boiler.....
Number of Boilers.....
Type.....H.P.....
Kind of fuel used.....

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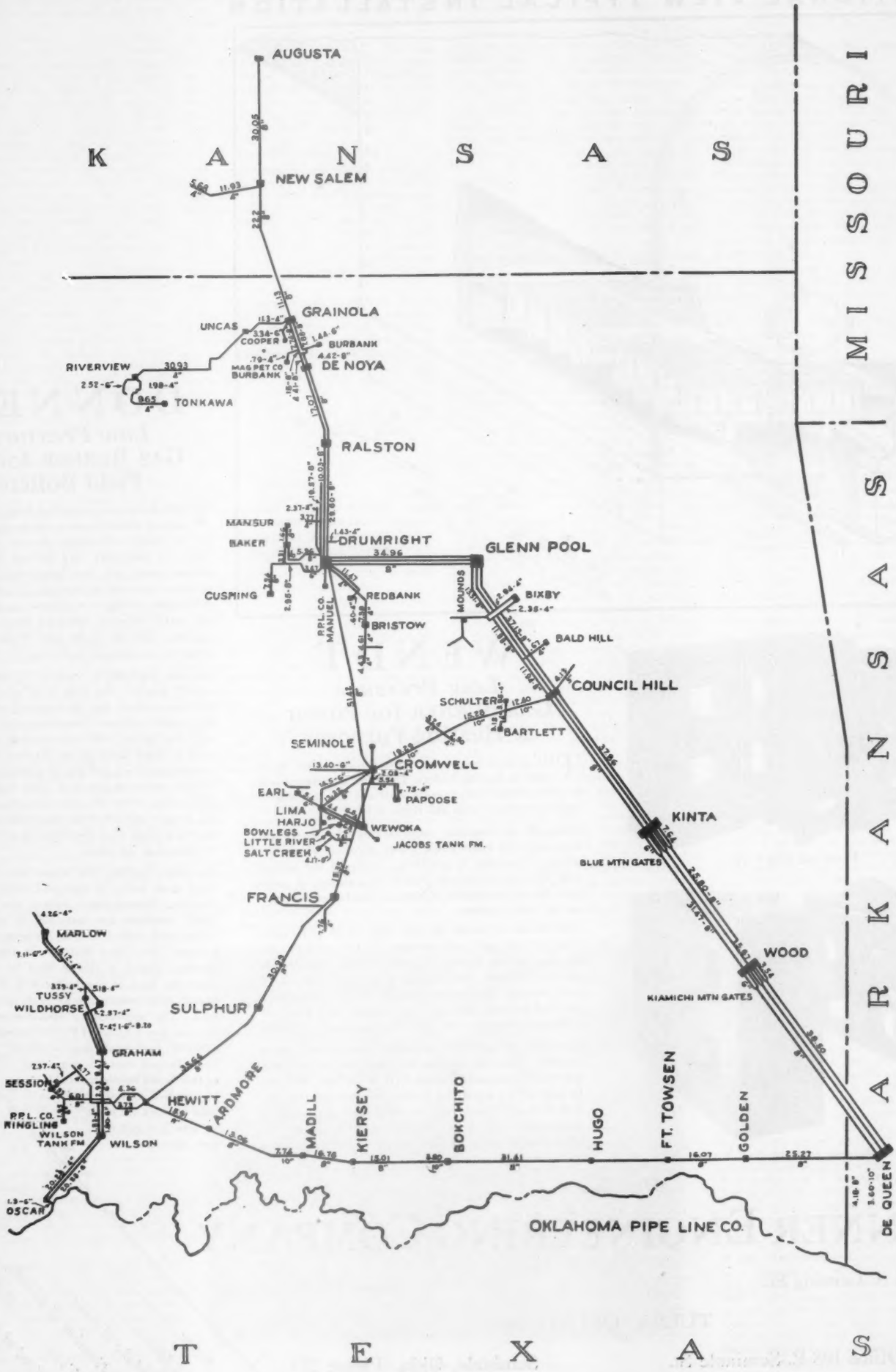
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Announce a change in the trade name of their welded tubular products from **"ETNA"** *to* **"SPANG"**, *effective immediately*

STANG

Communication Performs Vital Part

Major Pipe Line Companies Have Network of Wires to Important Oil Fields, Over Which Thousands of Messages Are Sent Daily

By H. E. Browne
Superintendent Telegraph Department, Prairie Pipe Line Co.

Everybody knows nowadays something about the pipe line branch of the oil industry of course, but relatively few persons know the vital part which the telegraph and telephone play in the daily operation of the pipe line. Few, for instance, know that each of the large pipe line companies must have its own private telegraph or telephone system. The reason for the private system of communication is obvious when it is realized that the commercial telegraph and telephone companies do not have offices in many of the out-of-the-way places where pumping stations must be erected. Besides this, the cost of using the regular commercial agencies for the mass of business that must be performed would be prohibitive. There would be delays too, delays that could not be tolerated in conducting a pipe line.

Should a break or big leak in a line be indicated by a sudden drop in the line pressure, it is imperative that the pumping station be communicated with promptly in order that the pumps be shut down and the loss of oil stopped pending necessary repairs. It is clear that there would be a long delay and heavy loss of oil if the company operating the pipe line did not have its own system of communication.

All trunk line stations have three telegraph operators working eight hours each daily. One of these operators is on the job constantly. These stations check by wire each hour throughout the day the amount of oil pumped and received, so that the dispatcher can detect anything wrong, such as a break or a big leak.

Need 161,000 Poles Annually

Some idea of the immensity of the pipe line telegraph and telephone systems may be gained by the fact that more than 161,000 poles are consumed annually by them in expansions and replacements. No figures showing the capital invested in these telegraph and telephone systems are available, but it is believed that a conservative estimate would place the amount at not less than $25,000,000. Construction of the communication system precedes the building of the line itself, and in the event of abandonment of a pipe line system the communication equipment is about the last thing to be removed.

The pipe line telegraph and telephone are operated as a rule 24 hours a day the year round. Beginning at 7 o'clock in the morning each station sends to the general office a stock report which shows the amount of oil received and pumped during the preceding 24 hours and the stock on hand at the time of sending the report. An engineer's report also is sent. This shows the amount of oil received and pumped, the amount of fuel oil and gas used, etc. Numerous messages pertaining to the company's business are sent too.

The wire system of a pipe line is in many respects like the wire system of a railroad. The pipe line station receives by wire all orders to start up and to shut down, and all communications from the oil dispatcher pertaining to the operation of the station are sent by wire. It is easy to see how the function of the wire system closely resembles that of the railroad. There is this important difference, however. In case of wire failure a railroad will operate on its regular schedule, but pipe line stations are obliged to shut down after a short time if communication cannot be re-established through some agency.

Line Walker Was Telegrapher Too

In the old days it was a rule to build the telegraph lines along the same right of way as the oil pipe lines. The line walker who walked these lines every day had to be an operator and carry a small telegraph instrument, along with a pair of climbers, connectors and pliers, as well as a caulking tool and hammer.

Some of the pipe line companies still build part of their lines along the pipe line right of way. The Prairie Pipe Line Co. is among those which have got away from this practice as far as possible and have their telegraph lines along highways where a line man can travel in a car and correct wire trouble within a short time so as not to cause the pumping station to shut down.

Telegraph and telephone lines are built more substantially now than in the early days and outside of lightning in the summer and sleet storms in the winter, there are only minor cases of trouble to contend with. Of course cyclones get in their work at times and high water washes poles out.

Pole lines generally are constructed now along the highways of 25-foot poles set 5 feet in the ground and 165 feet apart, making 32 poles to the mile. These generally are strung with two No. 9 copper wires which are transposed every half mile. This is the simplex system which gives a metallic telephone circuit and a telegraph circuit over these two wires.

The field gathering system and trunk lines are connected up so that in most cases direct communication is had with the general offices. Gaugers sending their runs over the wires in the afternoon and evening then mail in their tickets, which are checked for verification.

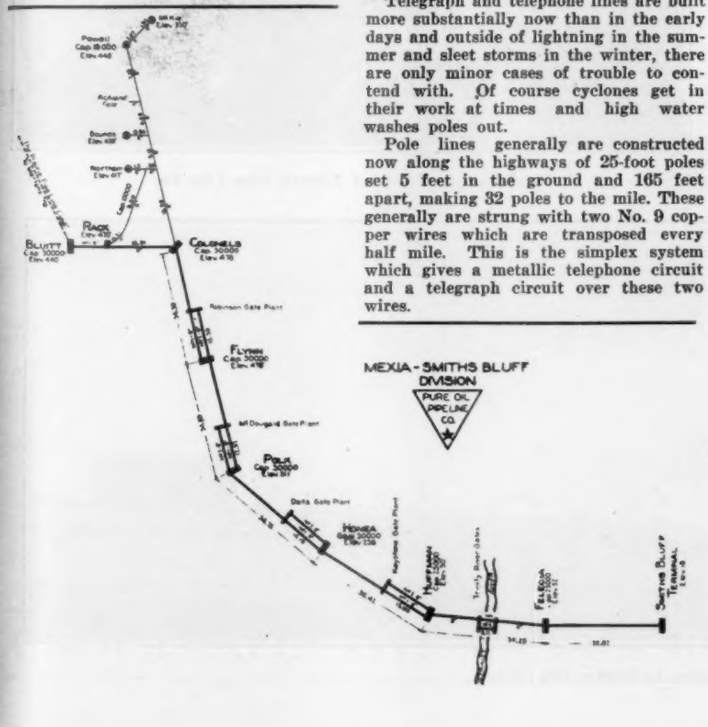
Most of the major oil and pipe line companies are members of the Petroleum Industry Electrical Association and this membership confers certain advantages, including better rental rates for the privilege of stringing wires on poles owned by other members of the association. For instance if the Magnolia Petroleum Co. already had a line running out to a field where the Prairie Oil & Gas Co. wanted to go it would be much more economical to string one wire on the Magnolia poles at a reasonable rental than to build another pole line. It might be too that the Prairie would decide to abandon its station in this field at the end of six months or so. All it would have to do with its communication equipment would be to take down the one wire which it had strung on the Magnolia poles.

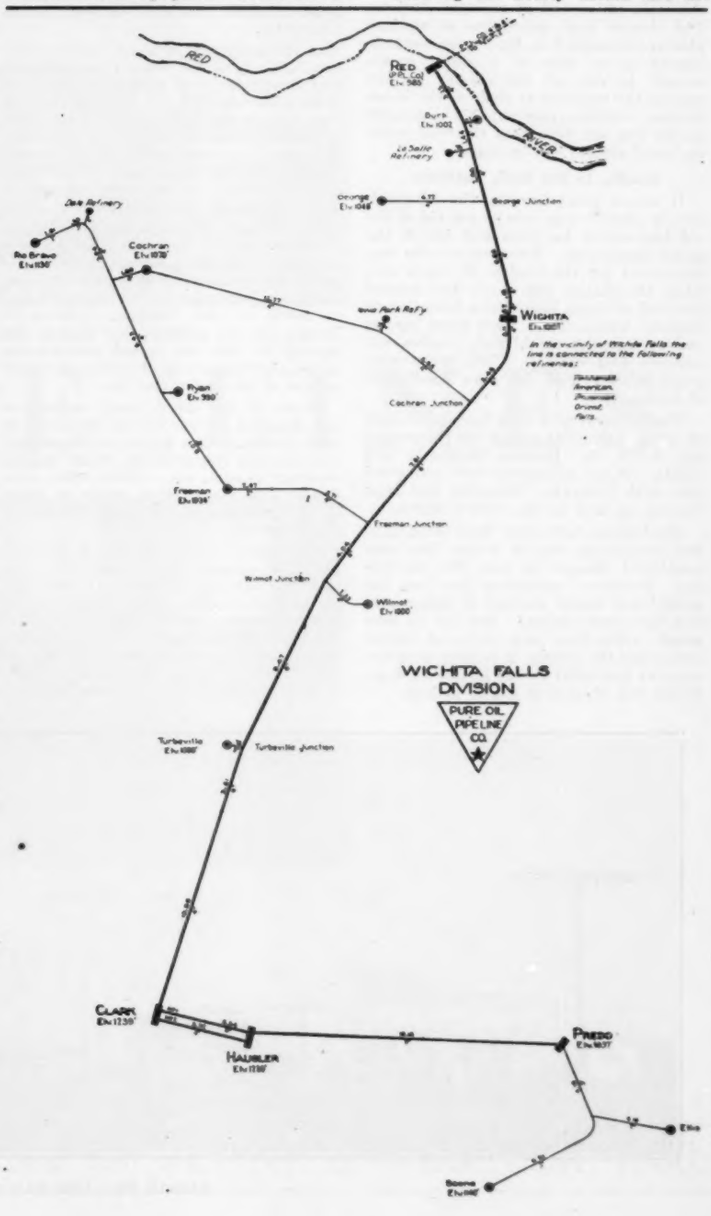
Poles of Commercial Lines Rented

Another common practice in the Southwest is to string wires on the poles of the Western Union Telegraph Co. or the Southwestern Bell Telephone Co. In this case the pipe line company puts up the wire under the supervision of the company owning the poles. The pipe line company then owns the wire but pays a yearly rental for the use of the poles, this rental depending upon the number of miles traversed by the wire.

As an indication of the extent to which different pipe line companies utilize the poles of other organizations it might be pointed out that the Prairie Oil & Gas Co., for instance, has 2,357 miles of wire on foreign poles and other companies have 2,424 miles of wire on Prairie poles. Thus, it will be seen, it is a matter of give and take.

Counting the hourly checks and the





regular run of messages to and from the field in the daily routine of business, the Prairie Oil & Gas Co. handles an average of 2,700 messages a day in the main offices besides more than 1,000 oil run reports. The Prairie has several wires more than 600 miles long, but each of these works through one set of repeaters, and of course the real length of a wire is determined at the repeater station.

Relies Chiefly on Telegraph

The Prairie system is mostly telegraph, which requires only one wire, while the telephone or simplex systems require two wires. The Prairie some years ago adopted the plan of using copperweld steel wire for its telegraph lines. This consists of 60 per cent steel wire with a welded covering of 40 per cent copper, giving it the copper conductivity and the steel for tensile strength. The change was made from solid copper to get away from hundreds of wire breaks caused by sleet sticking to wires in winter. The copperweld does very well for telegraph purposes with the addition of 25 to 35 volts more battery, but for a talking circuit it is not so good as solid copper.

The Prairie has private wires to all trunk line stations as well as gathering systems, with one to 12 wires on a pole. It has about 7,000 miles of wire and about 55,000 poles of various sizes. The rest of the wires are strung on foreign poles.

The battery for these wires is supplied for the most part by motor-generators at the main office and at repeater stations. The electric light generators at stations also are connected to the various switchboards so in case of a storm severe enough to cut off the regular battery supply, the operator at some of the intermediate stations can cut his generator on the line and thus keep the wire working until repairs can be made.

Goodby to Old Style Batteries

It was a great day for the telegraph system when it was able to get rid of the old blue-vitriol batteries and install the motor generators. The writer, who was wire chief for the Prairie 23 years ago, when the change was made, had several hundred of these blue-vitriol batteries to contend with. They were lined up on shelves, causing untold dirt, trouble, annoyance and expense. The other telegraph systems had the same conditions, of course.

The different pipe lines have a network of wires extending to all the important oil fields in Kansas, Oklahoma and Texas. Some companies are connected also with Colorado, Wyoming and New Mexico, as well as the eastern states.

The writer, who has been with pipe line companies for 39 years, has seen wonderful changes in pipe line machinery. Telephone equipment has been improved and better systems of transportation have been adopted. But the old telegraph, aside from new styles of instruments and the change in battery supplies, remains just what it was in the old days. It has not changed a dot or a dash.

The Prairie is among those companies which chose the telegraph for general use in transmitting communications because of the smaller likelihood of mistakes, especially in handling oil runs and other figures. The Prairie operates several telephones between its general office in Independence, Kans., and the office of its general superintendent in Tulsa. It also operates a simplex system of telephone and telegraph to all its stations in the Texas Panhandle system.

Has Reduced Tankage to Minimum

By R. W. Howe
Vice President and General Manager, Atlantic Pipe Line Co.

The main line of the Atlantic Pipe Line Co. extends from Wink through Midland to Port Arthur, Tex., a distance of about 580 miles. The portion of the line from Wink to Midland is standard 10-inch lap welded line pipe, while the portion from Midland to Port Arthur is 10-inch seamless pipe. This line is acetylene welded throughout, with the exception of about 20 miles which is electric welded.

In addition to the extensive gathering system in the Winkler Field, there is a 6-inch and 8-inch branch line which extends near Pyote, Tex., and down into the Shipley area of Ward County. The entire line is protected by coating, principally enamels, and great care was taken in the coating and ditching of this line, in order to get a line which would be as free from future trouble as possible.

All of the pumping equipment on this line is of the electric driven centrifugal type, there being two centrifugal pumps in series in each station. Power is furnished by three power companies—the Texas Electric Service Co., the West Texas Utilities Co., and the Gulf States Utility Co.

In the laying out of these stations very careful study of the topography and general conditions was made, and the stations were balanced out in order to provide for as nearly continuous through operation of the line as possible to reduce tankage to a minimum. As a result, there is only one small tank at each station, and much of the time the use of this tank can be dispensed with.

The station buildings are of concrete construction with concrete firewalls separating motors and pumps. In the building of the manifolds and piping for these stations, everything was standardized and as much of the bending, welding of flanges, etc., as possible, was done at the factory so that the actual construction of the pipe work in the stations was more or less of an assembling job.

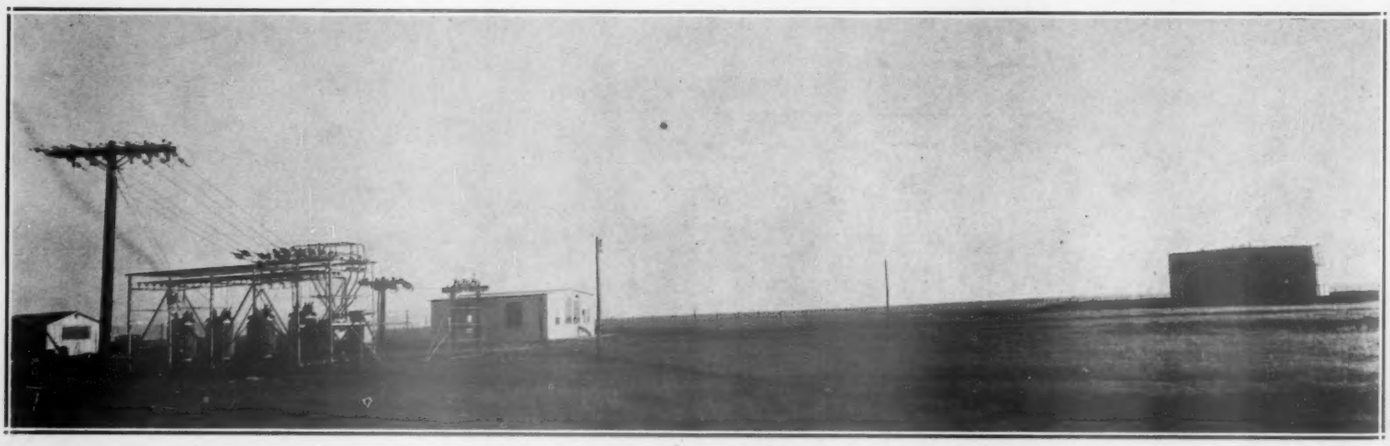
There is the usual small warehouse and dwelling houses for the operators at each station. The houses are equipped with electric refrigeration, water supply, sanitary system, etc. Deep wells were drilled and every effort made to make living conditions as convenient and healthful as possible.

The operation of the line is by telephone, a telephone line paralleling the pipe line throughout, with a branch line to the Dallas office of the company. The selector system is used with control stations at Midland, Dallas and Port Arthur, and the line, or a portion of it, can be operated from any of these points. This system has been found very satisfactory. The selector type of ringing avoids confusion of calls and the transmission of the system is very good.

The line terminates at the Atreco terminal of the company, near Port Arthur, Tex., where there is storage facilities and a recently installed loading system, capable of loading tankers in a few hours. All of the oil being transported through this line is for coastwise movement, the big bulk of which goes to the refineries of the company on the eastern seaboard.

Interior view of station of Atlantic Pipe Line Co.

Equipment in station of Atlantic Pipe Line Co.



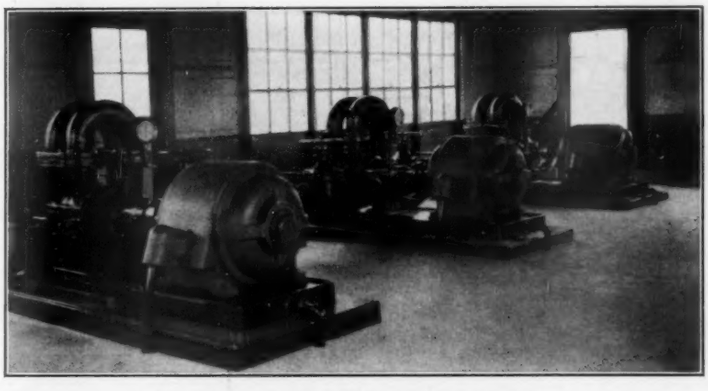
Atlantic Pipe Line Co.'s station at Garden City, Tex.

250 horsepower motors driving centrifugal pumps.

ELECTRIC POWER

1000 horsepower station.

FOR PIPE LINES



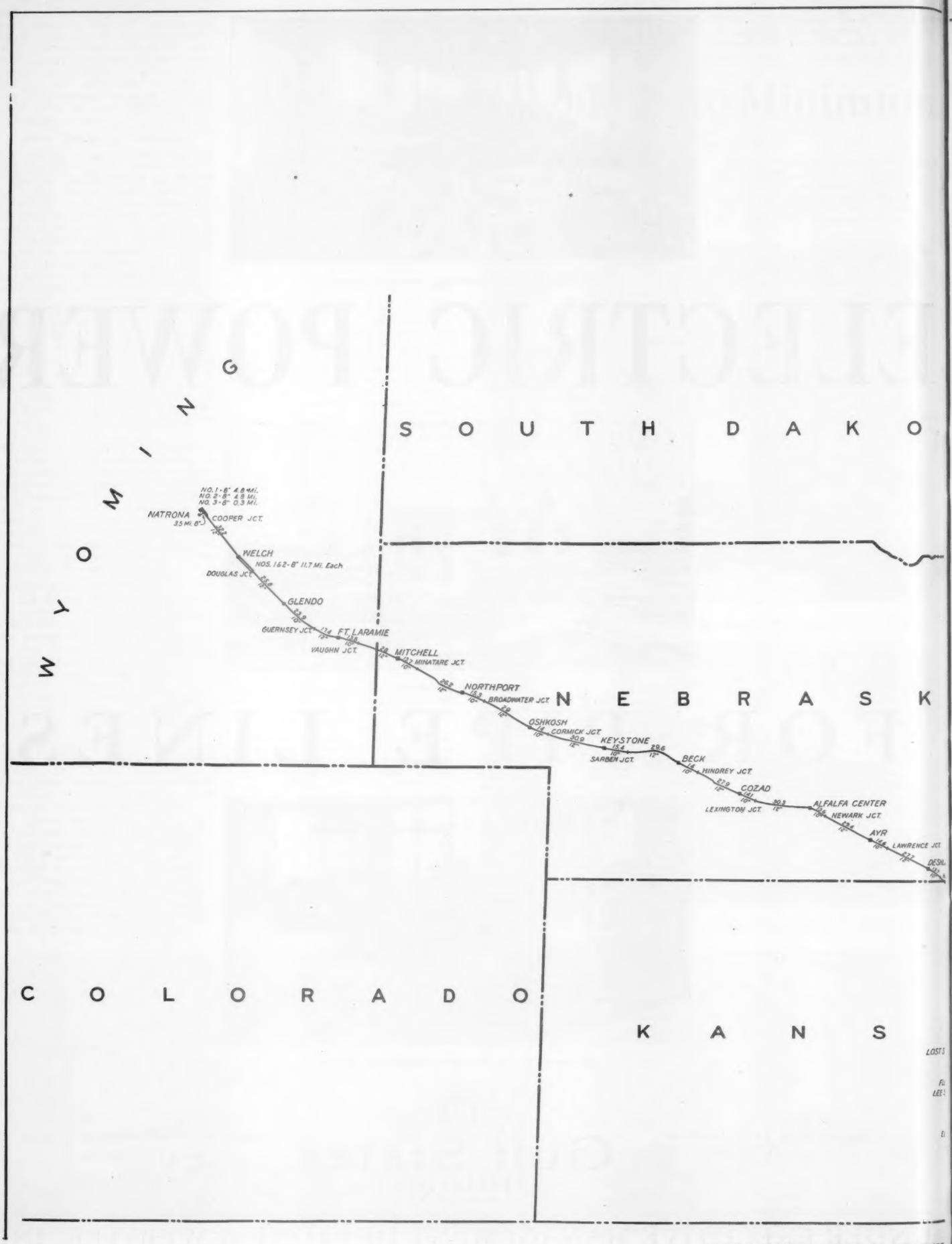
100 horsepower motors driving reciprocating pumps.

General Office Texas Division
Beaumont, Texas

Gulf States Utilities Company

General Office Louisiana Division
Lake Charles, La.

UNDER EXECUTIVE MANAGEMENT OF STONE & WEBSTER, INC.



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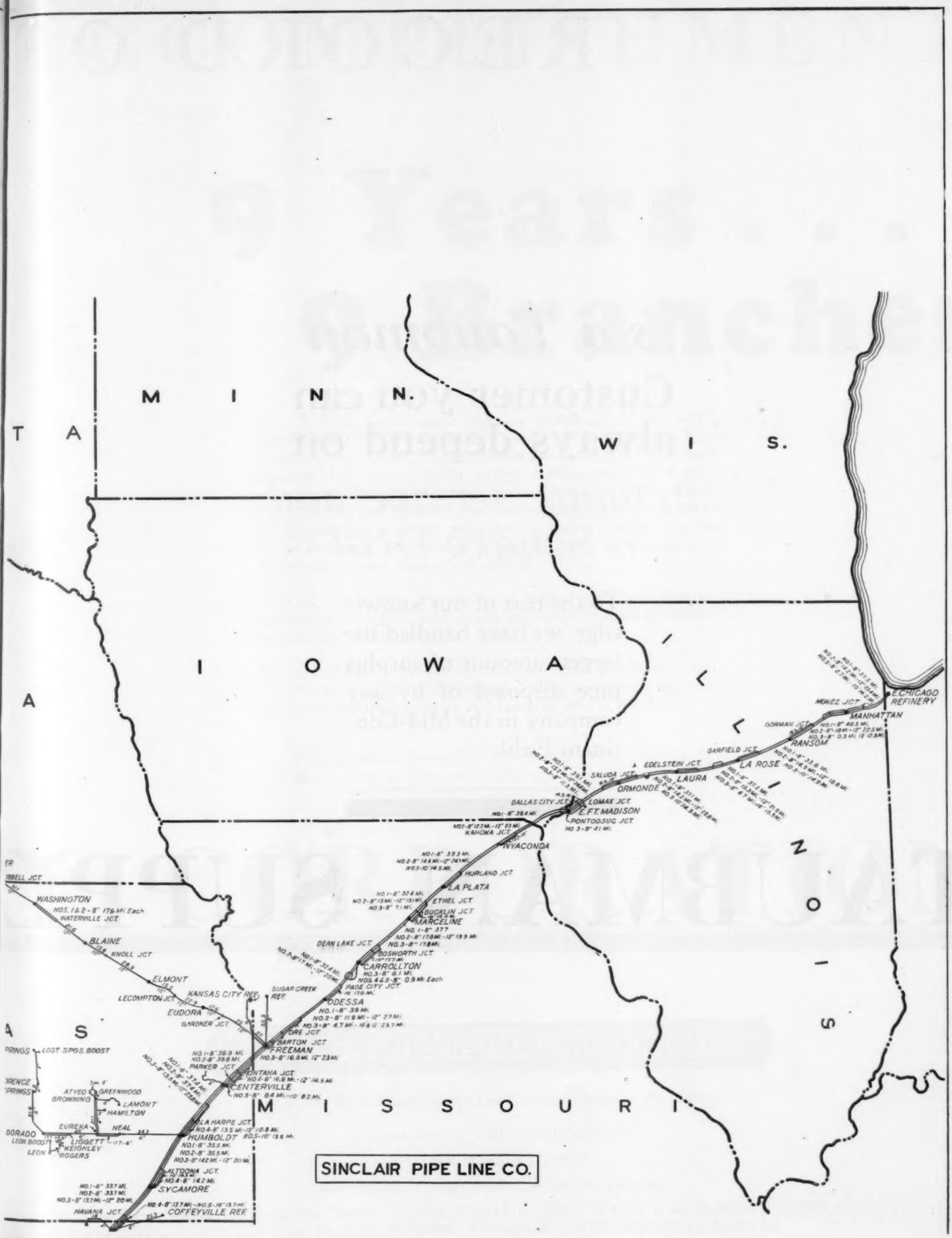

MAP IS ON PAGE T-88

RECORD OF

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To the best of our knowledge, we have handled the largest amount of surplus pipe disposed of by any company in the Mid-Continent Field.

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Our new seamless and lapweld casing and line pipe department is rapidly increasing our sales figures to several million dollars annually.

We are distributors for Pittsburgh Steel Products Company seamless pipe and Central Tube Company's lapweld, both with complete stocks at Memphis and at the Mills.

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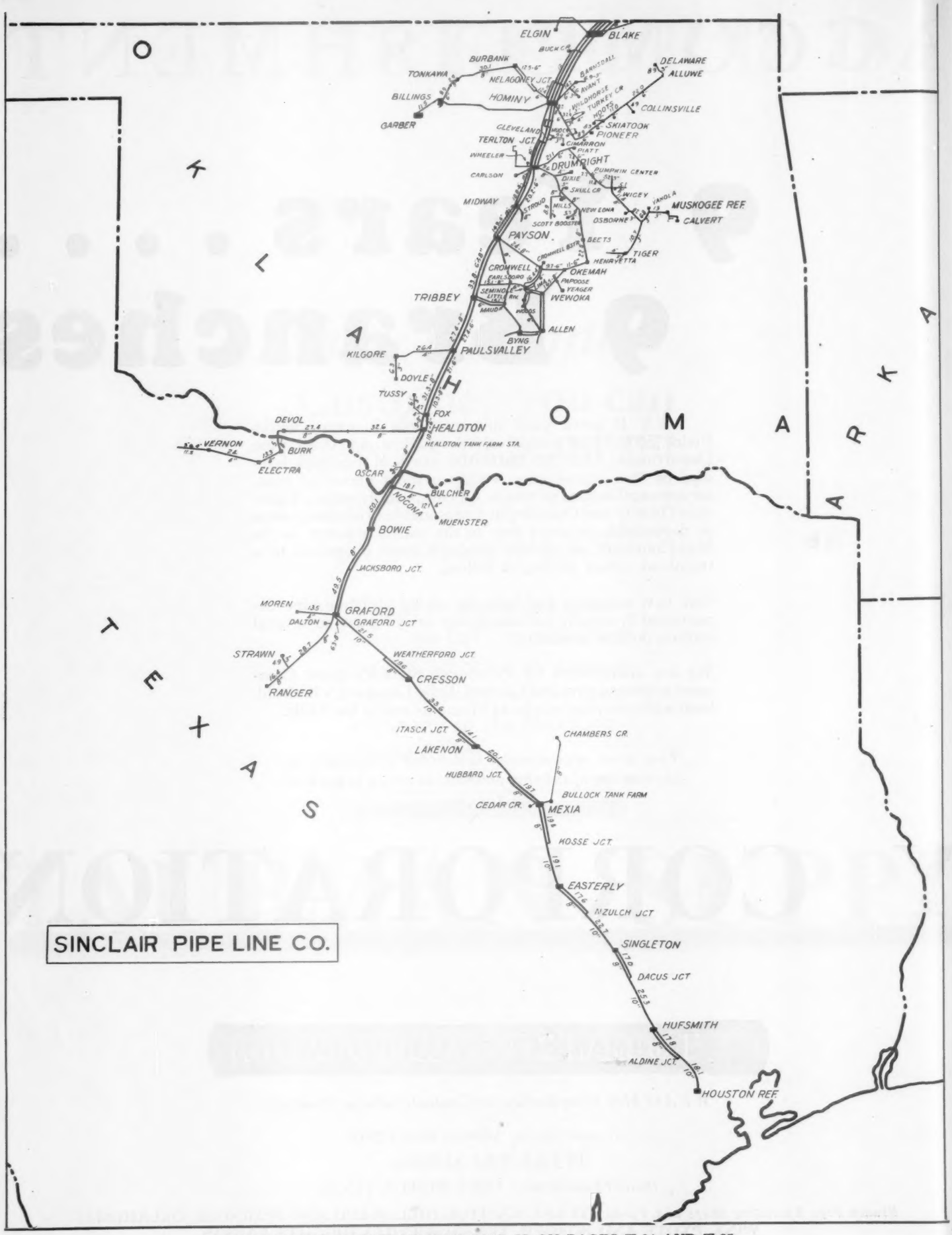
Branch Pipe Threading Shops and Yards: TULSA, CAPITOL HILL, MAUD AND SEMINOLE, OKLAHOMA; WINK, PYOTE AND BORGER, TEXAS; WICHITA HEIGHTS, KANSAS



THE UPPER PORTION OF THIS MAP IS ON PAGES T-84 AND T-85

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Wherever oil or gas is transported by means of pipe there you will hear them say that "Youngstown Pipe Is Good Pipe". This reputation is born of service and world wide use.

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CONTINENTAL

Operation of Diesels in West Texas

Extraordinary Conditions Encountered. Some of the Methods and Experiments Being Employed to Overcome Them

By a Representative of the Humble Pipe Line Co.

When an industry enters a new field there are almost invariably present certain unforeseen obstacles which must be overcome, and the advent of the Diesel engine driven pipe line plant into the West Texas area is no exception to this rule. The foregoing statement is no disparagement to the Diesel engine, as it is, and probably will continue to be the most economical type of prime mover for many years to come.

The two major causes which have added a trifle to the maintenance and operation costs of the Diesel engines in West Texas are fuel and water, and it is the purpose of this article to enumerate some of the troubles which we and others who are operating in West Texas have experienced and to mention some of the methods which are being adopted to overcome these obstacles.

The fuel used in Diesel engines for pipe line stations is in nearly all cases crude oil as it comes from the field. West Texas crude is of high sulphur content, and often contains as much as 6 to 8 per cent by volume of hydrogen sulphide together with a small amount of water globules and other foreign matter.

Troubles With Fuel

The first troubles experienced with this fuel were the frequent repairs and replacements to fuel valves, atomizers, pump plungers, obturators, springs, gaskets and numerous "gadgets" pertaining to the fuel system, and the first attempt at correcting this annoyance consisted mostly of replacing parts with special alloys and in some cases brought forth a partial redesign of fuel systems. Such experimentation resulted in much improvement but there later followed other annoyances such as excessive cylinder wear, fouling of exhaust valves, deterioration of fuel lines, both between fuel pump and spray nozzles and the outside gravity lines.

We recently had occasion to investigate the high cost of repair parts and extra labor at one of our West Texas stations and at that time we made a comparison with the average cost for six months' period of two other like capacity stations, both of which employ the same make of engine but use sweet crude for fuel and it was surprising to note that the costs of the West Texas station was considerably more than the average of the two stations using sweet crude fuel. All of this difference in maintenance would probably not be attributed directly to bad fuel in as much as when it is necessary to pull pistons and liners it is customary to bring the entire machine to first-class condition.

For several years we have kept a rather complete record of cylinder wear on our engines and our master mechanic has recently investigated the wear on 51 cylinders using West Texas crude for fuel and made a comparison with 44 cylinders on engines using sweet crude. In all cases the measurements of cylinders were made at right angles and parallel to crankshaft at a distance of 1 inch below the top of ring travel and the maximum measurement used to determine the average maximum wear per engine and it is interesting to note the following:

Sweet crude engines 1,035 hours run per .001-inch wear.

West Texas engines 232 hours run per .001-inch wear.

All of the above engines are the vertical type, four-cycle, ranging in bores from 14½ inches to 17 inches and in speeds of 200 to 275 revolutions per minute, and the engines burning West Texas crude are equipped with air filters of recognized merit; whereas, those using sweet crude are equipped only with a weather hood and one-fourth inch wire mesh on the intake. Hence it appears that the West Texas crude is also a contributing factor to cylinder wear.

Crankshaft Pitted

About a year ago we dismantled one of our West Texas engines and made the startling discovery that the crankshaft was badly pitted, some as much as one-sixteenth inch deep and 1 square inch in area, and upon investigation it was determined to be due to the presence of water which had condensed in the crank case, which coming in contact with sulphur washed down from the cylinders formed dilute sulphuric or sulphurous acid, thereby causing the attack, probably most of which occurred while the unit was idle. At that time we were using the batch method of reclaiming crankcase oil and in order to preclude any such recurrence we installed at two of our stations a continuous method of reclamation whereby the oil is circulated 8 to 10 hours per week per engine through the reclaimer. It was soon apparent that the crankcase oil could be kept in much better condition by this method than with the old batch system and we have since made this installation at all of our main trunk line stations.

Where the fuel is so bad it is difficult to keep an engine properly balanced and the installation of reliable thermometers or pyrometers is always a good investment. There is no doubt that such an installation will often save a serious repair bill as they will give an indication of trouble which might otherwise be overlooked.

Some of the operators in West Texas have installed centrifuge machines for the purification of fuel and from the reports obtainable it appears that much of their fuel troubles are being eliminated. They will unquestionably remove water and foreign matter and from some samples which we have analyzed before and after going through the centrifuge we also found some of the sulphur and much of the hydrogen sulphide were removed. If the hydrogen sulphide were the chief "trouble maker" most of it could be driven off by aeration. It would not be safe to do this in a steel tank on account of fire hazard due to oxidation of iron sulphide which forms on steel in the presence of the gas, but could safely be done in a wood or concrete tank.

It is usually customary to drill wells on the property for securing a supply of water for both circulating and domestic purposes but in certain parts of West Texas it is not always possible to obtain water that does not require treatment. It is often necessary to lay rather long lines to a creek or river, and water from such sources invariably requires treatment. The hardness of West Texas water varies from 14 to 15 grains per gallon to as much as 200 GPM or even more in some instances. It is not usually necessary to treat water of as low a degree of hardness as 15 grains per gallon providing the supply is ample and inlet water temperature kept below 120 degrees Fahrenheit. This, of course, depends upon the nature of the scale-forming salts. The scale-forming salts are usually sulphates, carbonates, bicarbonates and chloride of magnesium and calcium and the most common method of treatment is the lime and soda ash process, and where used for domestic purposes chlorinated lime is used. After treatment with lime it is often desirable to use a coagulant such as ferrous sulphate or sodium aluminate in order to accelerate the settling of sludge. It is necessary for the operating engineer to keep a close check on the raw water supply as the degree of hardness will vary from time to time, which of course necessitates changes in the treatment. Another method employed very satisfactorily, especially with waters of comparatively low degree of hardness, is the zeolite process. With this arrangement the raw water is pumped through the zeolite (complex silicate of aluminum and sodium) and an exchange of the calcium or magnesium made for the solution.

After the removal of calcium and magnesium from the water to the capacity of the zeolite regeneration is made with sodium chloride forming sodium zeolite again and the chloride of calcium and magnesium are wasted. The presence of a small amount of iron in the raw water will soon render the zeolite ineffective. This latter method where possible to employ is much cleaner and easier to operate.

At some points where the water supply is sufficient and is not too expensive to treat the temperatures of jacket water are kept below the dangerous point by using only reservoirs with large surface cooling areas. At other stations where reservoir capacity is limited this is accomplished by using a cooling tower either on part time or full time operation during the hot weather.

In either one of the above methods the evaporation losses are high, due to the extreme dryness of the atmosphere and there is also considerable loss from cooling. A periodic analysis must be made of reservoir water on account of possible concentration due to evaporation or the continual accumulation of alkali dust and sand in which case it is sometimes necessary to waste considerable overflow water or to treat the reservoir in order to bring the hardness down to a point where cylinder head breakage will not occur.

Jacket Water Systems

Some companies have found it advantageous to install closed jacket water systems, which in most cases have proved very satisfactory. There are two general types of heat exchangers on the market, namely: the multiple pass tube which is installed under a cooling tower and the closed type through which both raw and jacket waters are circulated. The selection of proper type equipment depends largely on the nature of raw water supply, the ease of cleaning and the cost of the apparatus.

Some companies have installed home-made equipment and have obtained fairly satisfactory results. However, it is doubtful whether any real saving in cost could be accomplished because of the increased efficiency of the apparatus available on the market.

Some are experimenting with closed-type exchangers using either the incoming oil stream or the suction stream for cooling jacket water. The most obvious disadvantage to this scheme is the extreme corrosive nature of West Texas crude with the probable development of leaks which might play havoc with the entire circulating system. Should leaks develop there would probably be formed a certain amount of dilute sulphuric and sulphurous acids especially at the exchanger where temperatures would tend to accelerate the reaction. If this system were installed on the incoming stream there would no doubt be some added vapor loss at the storage or working tanks due to the temperature increase of the crude.

While the inability to always have good water and in sufficient quantities for jacket purposes contributes slightly to the cost of Diesel operation in West Texas and places an additional burden upon the operating engineers, we feel that all operating companies will soon have installed facilities either to eliminate or minimize this condition.

Sand Difficulty

There are frequent sand storms in parts of West Texas which are very annoying and I might say exasperating, but it is said that after one lives there for a while he soon becomes accustomed to them and accepts them as a matter of course. At all times, too, there is a continual drifting of sand and dust near the surface and it is necessary to install some type of air filter or cleaner on the cylinders and compressor intakes of Diesel engines.

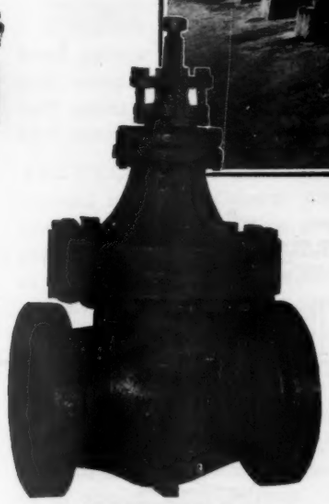
There are three general types of filters on the market, namely: the cell type having filtering medium requiring occasional washing and dipping in a viscous liquid; the filter bag type, and a mechanical centrifuge type; all of which, according to reports, give satisfactory service. Some have experimented with a water type filter involving the principle of pulling the air either through a spray or film of water, but we have not received any definite information as to the results obtained. I might mention that upon overhauling of one engine we have found as much as half a shovel of sand in the intake header. This, of course, would not have occurred if intake had been provided with filter of recognized merit and given a reasonable amount of attention.

BIG SHOVEL AT WORK ON PIPE LINE

WESTCOTT VALVES

PRECISION!

An installation of 8" Westcott Valves on a main line manifold of the Prairie Pipe Line Co., Caney, Kansas



An 8", 800 lb. semi-steel brass mounted Westcott Valve. 1600 lb. test.

The precise care with which Westcott Valves are made from the pouring of the metal down to machining and assembling is responsible for their absolute dependability and long life. All Westcott Valves are tested to double working pressure.

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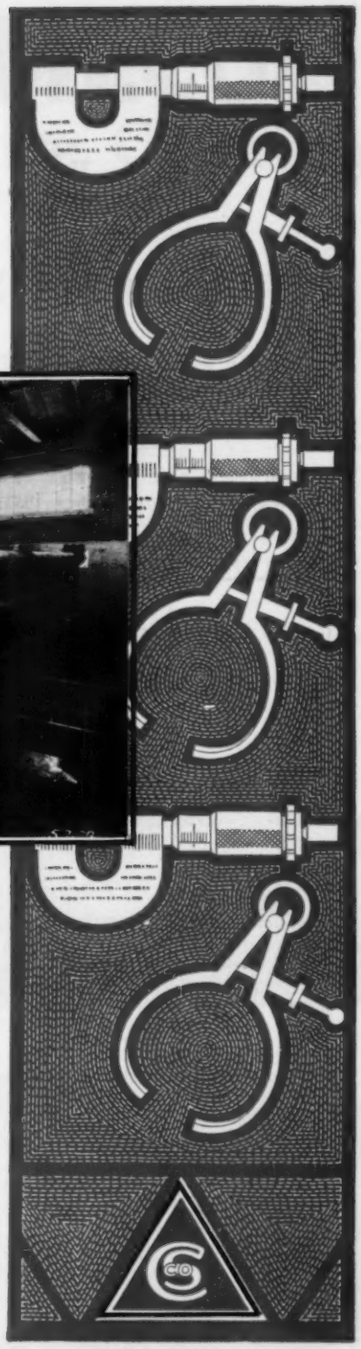

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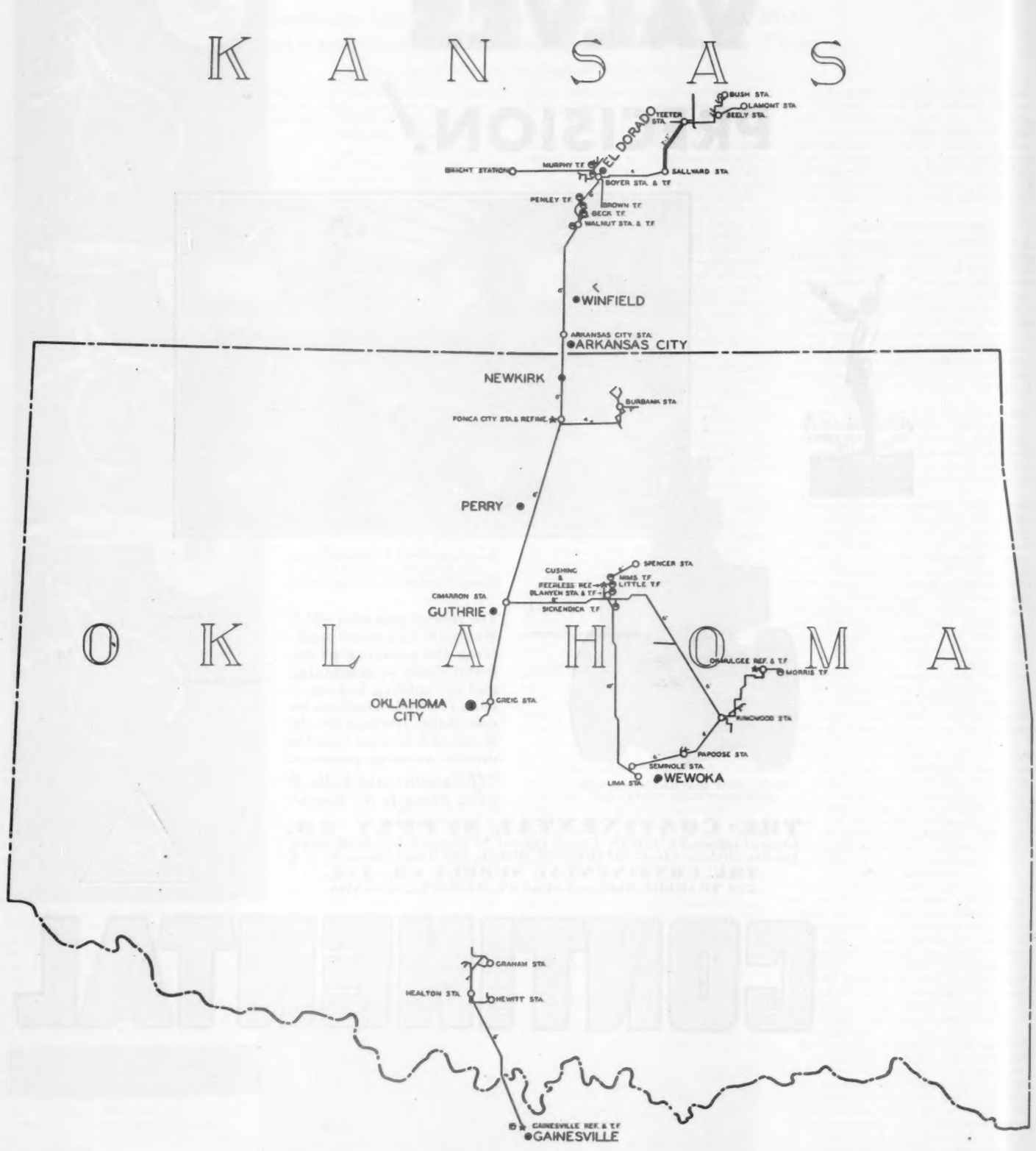

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Pipe Line Coating

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TNEMECOL Pipe Line Coating, like the same manufacturer's Tnemec Paint, is a product of unrivalled toughness and durability especially designed to protect underground pipe lines.

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Sold by all CONTINENTAL stores, in any quantity from a barrel to a carload.

TNEMEC Ideal for Galvanized Iron

Most paints will not adhere to galvanized iron, when it is new. When it is rusty, ordinary paint will not hold unless the rust is first removed.

TNEMEC has proved an ideal paint for galvanized iron. Its Cement pigment has certain natural qualities that overcome both of these difficulties. Rust need not be removed, as the Cement in TNEMEC Paint absorbs and neutralizes incipient rust. A trial will convince.

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TNEMEC Floor Paint is a super-durable floor paint, which we can highly recommend for all kinds of floors, whether wood, cement, or of special compositions. It is especially recommended for cement floors. Unpainted cement floors shed a fine dust, soak up oil and grease, deteriorate and wear. TNEMEC Floor Paint gives full protection against all these evils. One gallon gives two coats for 250 to 300 square feet of floor.

A galvanized iron hangar painted with Tnemec Paint.

Applying Tnemec Floor Paint in a Mid-Continent plant of a leading refining company.

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California Extending Its Gas System

Development of Big Oil Fields Has Provided Extensive Supply of Natural Gas Which Is Being Piped Throughout State

By L. P. Stockman

One of the most important developments in California during the past several years has been the tremendous expansion of the natural gas industry and, while a phenomenal growth has been experienced up to the present time, the next several years will witness a further substantial increase in both consumption of natural gas and the installations of additional facilities. For many years operators considered natural gas as a necessary evil and merely incidental to the production of crude oil and natural gasoline. This era has passed, however, as subsequent study and experimentation has revealed the advantages resulting from a judicious use of the inherent energy of natural gas. Natural gas is of paramount importance from an economic standpoint. Oil and gas, being basic commodities, obviously exert a tremendous influence in progressive areas by stimulating manufacturing, and this in turn reflected in rural communities where the pursuit of agriculture predominates.

The transmission of natural gas from the various oil fields to the centers of population for commercial consumption has resulted in the laying of more than 5,000 miles of new gas lines in California during the past 10 years, and several hundred miles more will be laid before 1929 draws to a close. The economic importance of a sustained production of natural gas cannot be stressed too much as cheap reliable fuel is the basic foundation for low manufacturing costs. Several large manufacturing plants have recently been completed in southern California due primarily to this important factor, and the San Francisco Bay region, which has been relying upon artificial gas up to the present time, will probably also reflect a similar condition in the near future, as this area will soon be using natural gas almost exclusively. San Diego in southern California, can also be expected to show considerable expansion in the not far distant future as tentative plans contemplate the laying of a 16-inch natural gas line southward to La Jolla, where connections will be made with existing facilities which are at present serving artificial gas.

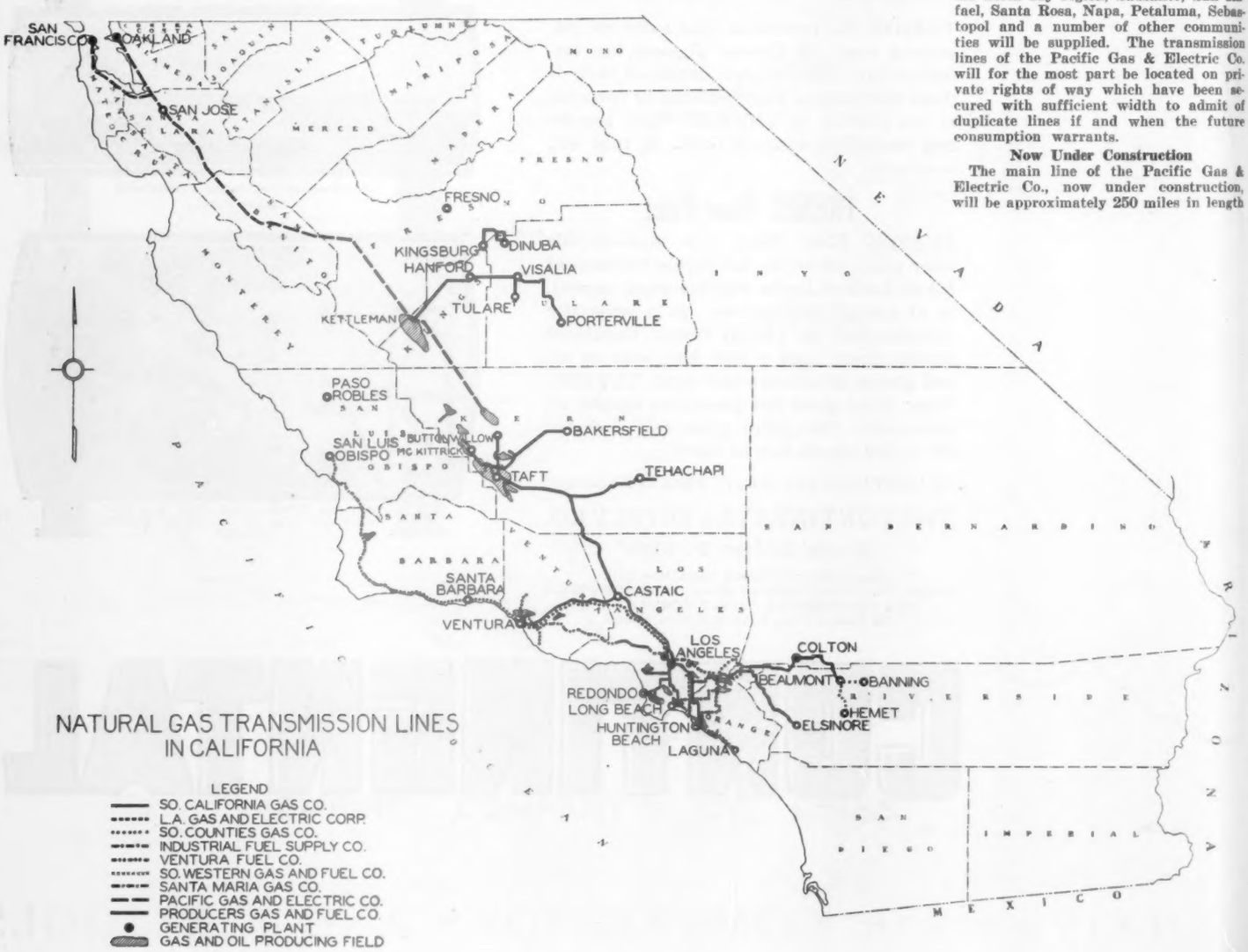
Line to San Francisco

The new industrial fuel which will soon be available in the San Francisco Bay region will be transported northward from the southern part of the San Joaquin Basin through the facilities of the Pacific Gas & Electric Co. The State Railroad Commission recently granted the Pacific Gas & Electric Co.'s application for a certificate of convenience to construct and operate the natural gas transmission system which is now under construction from the Buttonwillow Natural Gas Field of Kern County, to Oakland and San Francisco. This new line, however, is really only the first unit of a comprehensive plan to supply natural gas throughout northern California, reaching from Fresno in the south, to Sacramento and Woodland in the north. Ultimate Marin, Sonoma, Napa and Solano Counties will be supplied by the laying of a pipe line across the Carquinez Bridge. The Pacific Gas & Electric Co. is at present supplying 98 per cent of all artificial gas now sold in this territory, and this projected system will reach 96 per cent of the 500,000 customers connected with its present system. The first unit now under construction from Buttonwillow to the San Francisco Bay region will cost approximately $13,000,000, and present plans call for completion of construction work some time around the first of September.

The Pacific Gas & Electric Co. now has pending before the State Railroad Commission a second application for a certificate of convenience and necessity, calling for construction of the second projected unit of its gas transmission system. The ultimate cost, including the main trunk now under construction, will be around $26,000,000, and will have an aggregate capacity of 250,000,000 feet of natural gas daily. This is about four times the amount of natural gas now being consumed in that territory. The completed system, which will include more than 700 miles of main transmission lines, contemplates a new second line northward from Kettleman Hills up through the San Joaquin Valley, through Contra Costa County, to connect with existing facilities at Richmond. This will make a complete loop and provide standby service, or rather duplicate facilities, for the entire San Francisco Bay region. One branch line will serve Stockton, Lodi, Sacramento, Roseville, Woodland and Santa Cruz. In the San Joaquin Valley the line is easily accessible to Modesto, Patterson, Newman, Gustine, Merced and other rural communities. A contract has already been entered into to supply the Modesto Gas Co., and other similar agreements will be consummated in the near future. In the north bay region, Sausalito, San Rafael, Santa Rosa, Napa, Petaluma, Sebastopol and a number of other communities will be supplied. The transmission lines of the Pacific Gas & Electric Co. will for the most part be located on private rights of way which have been secured with sufficient width to admit of duplicate lines if and when the future consumption warrants.

Now Under Construction

The main line of the Pacific Gas & Electric Co., now under construction, will be approximately 250 miles in length



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STORES

Dig pipe trenches, and test pipe lines for less

Pipe Laying

A Sullivan Vibrationless Portable Compressor and a Sullivan Rock Drill, Buster, and Spader—will cut your costs for trench digging, and make you less dependent on hand labor.

A Sullivan Rock Drill operated by a portable compressor, is shown below, cutting a trench through rock for a gas pipe line. These drills are available in numerous models, suited to every rock drilling job.

Where pipe lines are to be laid or repaired under pavement, Sullivan Concrete Breakers and Clay Spaders will triple the speed of hand labor. Spaders are particularly useful for narrow trenches, and for digging under street intersections.

Back up an outfit of these tools, with a Sullivan Vibrationless Portable Air Compressor — and you will get your pipe lines in, quickly, when you want them.

Vibrationless Compressors can be had in 110, 160, 220, or 310 cu. ft. sizes, on steel wheels, trailer trucks, or skids. *Send for the picture book, "Speed Up With Air."*

Testing Pipe Lines for Tightness

Special high pressure Sullivan Air Compressors are available for testing pipe-lines for tightness. These were designed for economical and trouble-free outdoor service—and can be operated on skids as shown in the picture.

Catalog 83-J

THE PICTURES

Sullivan 110-ft. Vibrationless Portable Air Compressor, suitable for operating 1 Rock Drill, 2 Concrete Breakers, or 3 Clay Spaders.
Sullivan Rock Drill cutting a trench through rock.
Sullivan Balanced Angle Compressor testing on the Uinta 16-inch gas line between Baxter, Wyoming, and Salt Lake.

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825 Wrigley Bldg., Chicago, U.S.A.
(Continental Supply Co., distributes Sullivan Equipment in the Mid-Continent Field)

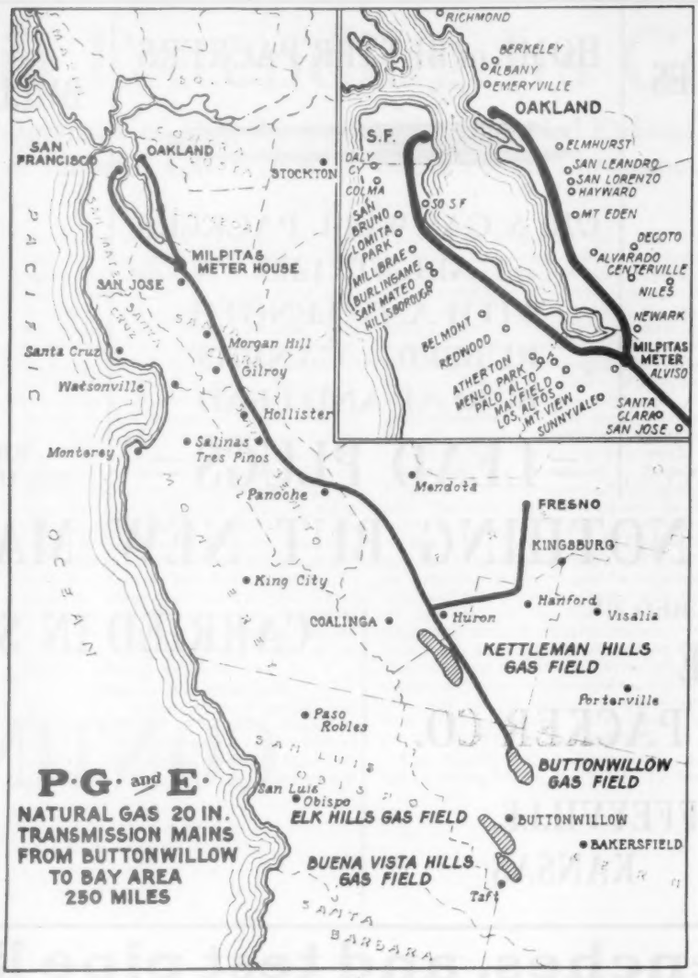
SULLIVAN AIR COMPRESSORS AND AIR TOOLS

exclusive of the east and west branches which extend up on both sides of San Francisco Bay. It will be a welded job from start to finish, and will be tested for pressure considerably higher than the actual operating pressure of the line when in active operation. A little unexpected delay has been encountered during the past month due to lack of competent welders. The extreme heat encountered up through the San Joaquin Valley has retarded construction, as welders do not remain on the job any length of time. The first shipment of pipe for this new line consisted of 132 cars of pipe, comprising two solid train loads of 62 cars each. Since arrival of this shipment at Tres Ponis a few months ago, the entire line has been laid and welded except a short distance north of Kettleman Hills. Construction work on this new natural gas line started from several points at about the same time, and each ditching and welding crew averaged better than 2 miles daily.

The Pacific Gas & Electric Co.'s new installation, which is one of California's largest gas transmission systems, will be a 16-inch welded line running from the Buttonwillow Gas Field of Kern County to the Kettleman Hills Field of Kings County, a distance of about 40 miles. From Kettleman Hills northward the line is 22 inches in diameter as far as Mendota, in Fresno County, at which point it is reduced to 20 inches. After leaving the latter point, the line turns westward through Panoche Pass to Tres Pinos, and then runs northward through Hollister, Gilroy and San Jose to Milpitas, located at the southern extremity of San Francisco Bay. The line branches east and west to Milpitas, one trunk going up along the east side of San Francisco Bay, and another up around the west side. The east branch will supply Oakland, Alameda, Berkeley and Richmond, while the western extension will meet the requirements of San Francisco, San Mateo, Palo Alto and other suburban towns enroute. A new 10,000,000 foot gas container has been erected in San Francisco, and an 8,000,000 foot container fabricated in Oakland, increasing the aggregate storage facilities in the two bay cities to more than 60,000,000 feet. A number of smaller town in the San Joaquin Valley will be supplied with natural gas by laying laterals from the main system. The city of Fresno will be supplied through an 8-inch branch, which will leave the main line at Huron and run 40 miles across the floor of the valley. Including this branch and the line from Milpitas to Oakland, 282 miles of pipe has been required. To transport most of this pipe from eastern mills a total of 1,500 railroad cars was needed.

Delivery Pressure 400 Pounds

Natural gas will be delivered to the pipe line department of the Pacific Gas & Electric Co. at Buttonwillow and Kettleman Hills at a pressure of 400 pounds. Friction will reduce this pressure enroute to such an extent that it will arrive in Oakland and San Francisco at a pressure of around 50 pounds. Long term contracts have been negotiated in both the Kettleman Hills and Buttonwllow fields, and plans have been made to assure an ample supply of gas for a long period of years. It is believed that gas consumption will show a substantial increase in the San Francisco Bay region, as proposed special commercial rates should induce additional manufacturers to locate in that section. As soon as the demand warrants a large compressor plant will be erected adjacent to Kettleman Hills to add to the supply. A new metering plant is being constructed at Milpitas where the main line branches east and west up the bay, and at a little later date a booster station will be constructed between Kettleman Hills and San Jose. This will give the present line an ultimate capacity of about 125,000,000 feet daily, with a further increase of another 125,000,000 feet daily upon completion of the second projected line, which will parallel existing facilities for some distance and then swing along a north route up through Sacramento and Stockton and terminate at Richmond.



The Kettleman Hills Field of Kings County, where the Pacific Gas & Electric Co. will probably secure most of its future supply of natural gas, is generally believed to be the largest single structure ever opened up in California. The Milham's discovery well, which was finished in October of last year, is still flowing 3,400 bbls. of high grade crude and about 70,000,000 feet of natural gas daily. Subsequent completions, which include the Shell's No. 1 Armstrong and the Standard's No. 81 in Section 11-22-17, all tend to confirm the generally expressed belief that Kettleman Hills will prove a vital factor in the future economic structure of the Pacific Coast. There were 30 strings of tools in operation at Kettleman Hills during the month of July and, while conservation work is expected to retard the development of substantial production until July 1, 1931, this action will prove advantageous as the preventing of gas waste will result in a longer sustained production and a larger ultimate recovery. At Buttonwillow, where the Milham Exploration Co. discovered a commercial dry gas field and subsequently finished eight wells, additional substantial quantities of natural gas are being held back waiting completion of the new line. The Milham, which has already proven up two separate gas zones of high potentiality in this field, has just undertaken a deep test for the purpose of testing out this structure for oil possibilities. The company has a good chance, incidentally, of finding oil in this area, and subsequent developments may result in the discovery of a new oil field.

It is the present intention of the Pacific Gas & Electric Co. to use large quantities of natural gas in its steam electric generating plants in San Francisco and Oakland, including a large new steam plant about to be constructed in the former area. Household consumers will be served a mixture of natural and artificial gas, but large commercial industries located close to the main lines, which will pass through the principal industrial centers, will be supplied with straight natural gas. Unusually low rates will be available to industries that can use natural gas at night during the off-peak period when there is not a great demand for domestic purposes. The mixed gas will contain 700 heating units, as compared with 550 carried by the artificial gas now being distributed. The introduction of natural gas into northern California will do much to conserve a natural resource by providing a market for gas production which would have to be either blown into the air or conserved under the ground in conformity with the recently enacted gas conservation law.

Development work in Los Angeles Basin fields during the past few years has resulted in an overproduction of natural gas with the result that large quantities have been blown into the air.

Casinghead Gas

Practically all of the natural gas produced in California is casinghead gas produced in conjunction with crude oil as the only commercial gas field developed up to the present time has not been permitted to produce. This gas field located at Buttonwillow in Kern County will, however, become an important factor in future economic conditions on the Pacific Coast and it is quite probable that the Milham Exploration Co. will begin partial production in this field soon as the Pacific Gas & Electric Co.'s new pipe line to San Francisco is rapidly nearing completion. The physical solution of casinghead gas and oil is of paramount importance to distributors of natural gas as the rate of production of oil and gas are interdependent and one cannot be regulated without seriously affecting the other. The oil production of a normal well has a value several times as great as that of its gas output and the demand for crude oil will therefore determine the rate of production of both oil and gas if economic considerations alone control producing operations. The new gas conservation law may remedy this condition, however, because in order to eliminate gas waste operators will be obliged to restrict production of crude oil.

ONE WAY OF BENDING A PIPE LINE

Crew of Standard Oil Co. of California constructing line in San Joaquin Valley.

Prompt Delivery on all

J&L PIPE

When you order J & L Seamless Steel Casing, or any other J & L Tubular Products, you obtain, at no additional cost, delivery service that is equal in every respect to the unsurpassed quality and dependability of the pipe itself.

Our ownership-control of all factors in the making of tubular goods, from raw material sources to the most modern tube mills, is your assurance that our production will always be ahead of demand. We maintain an extensive warehouse and yard at Memphis, well stocked with adequate supplies of J & L pipe, both welded and seamless, supplemental to well-rounded out stocks carried by our distributors in their yards at strategic points in the oil and gas fields to serve emergency requirements.

To have pipe on hand when you need it, order J & L.

J&L STEEL

Identify by Jones & Laughlin on every length

Your Guarantee of Prompt Service

J & L own and operate, not only the most modern tube mills, steel plants, and blast furnaces, but also mines and quarries, and transportation facilities. Thus, we control all factors entering into volume production of J & L tubular products.

Large and complete stocks of tubular goods, welded and seamless, are carried in this extensive J & L Warehouse and yard at Memphis, Tenn., to meet the service requirements of the trade and for quick replenishment of our distributors' stock in the field, used in serving emergency needs.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH PENNSYLVANIA

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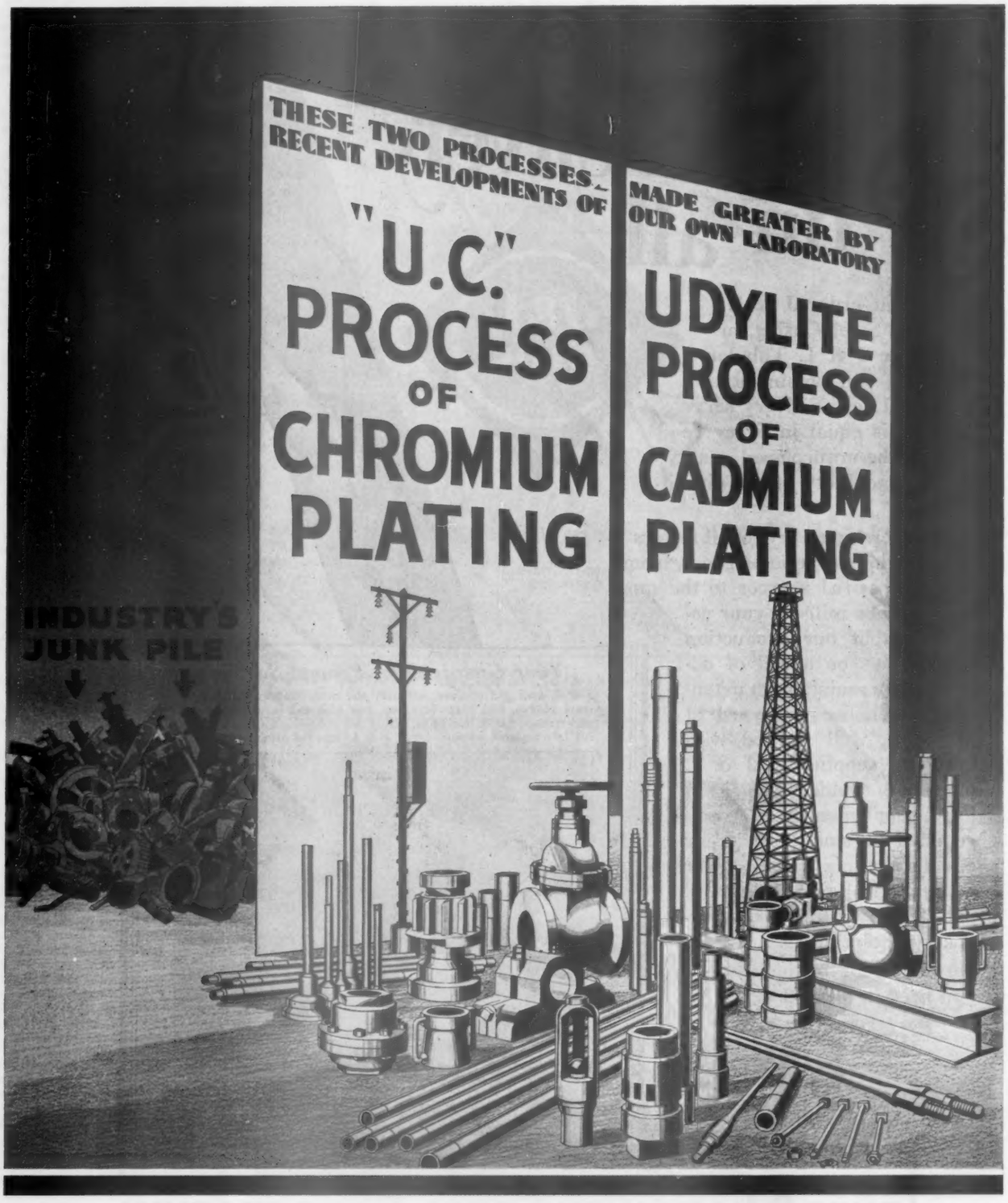

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Office and Plant: SAND SPRINGS, O

Modern Protective Metals

Stands between YEARS of ADDED SERVICE and RUST, EROSION and CORROSION on

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THE MODERN METHOD OF RUST PROOFING

Rust proofs Structural Steel, Bolts and Nuts, Fencing Material, Derricks, Sub Stations, Nails, Casing, Steel Window Sash, Pole Line Hardware, Airplane Parts, Pipe, Sucker Rods, Metal Lath, Cooling Systems, Hoisting Equipment.

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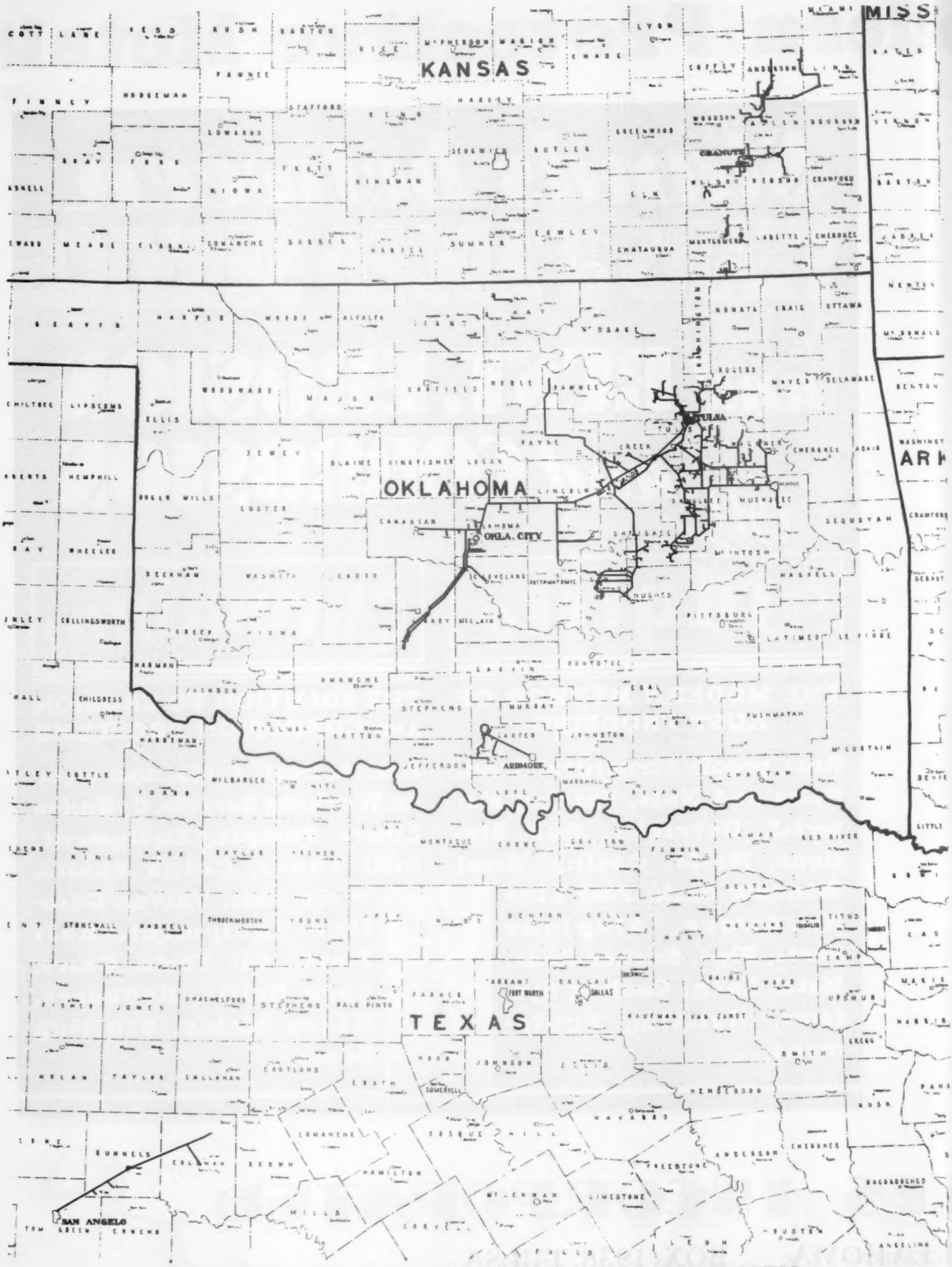
THE SOLUTION TO EROSION AND CORROSION PROBLEMS

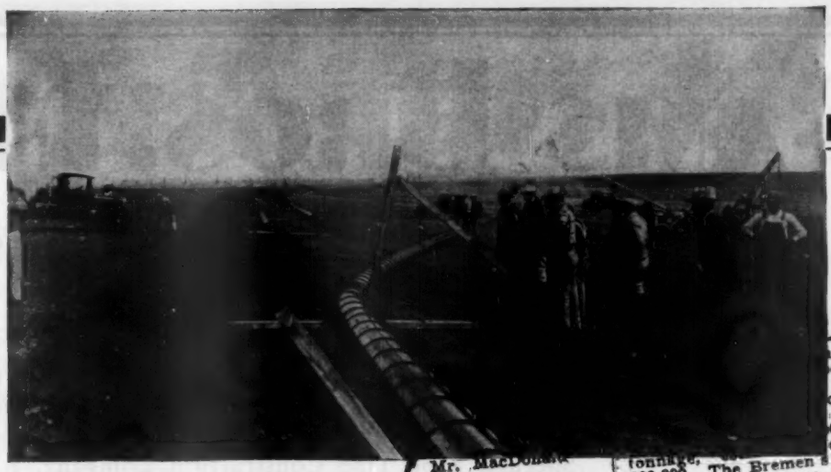
Resists heat, acids, and wear on Working Barrels, Cylinder Liners, Pumping Equipment, Still Tubes, Crank Shafts, Wrist Pins, Valves, Gasoline Equipment, Ball Floats, Oil Tools, Gears, Core Drills, Reducers, Glass Molds, Stuffing Boxes.

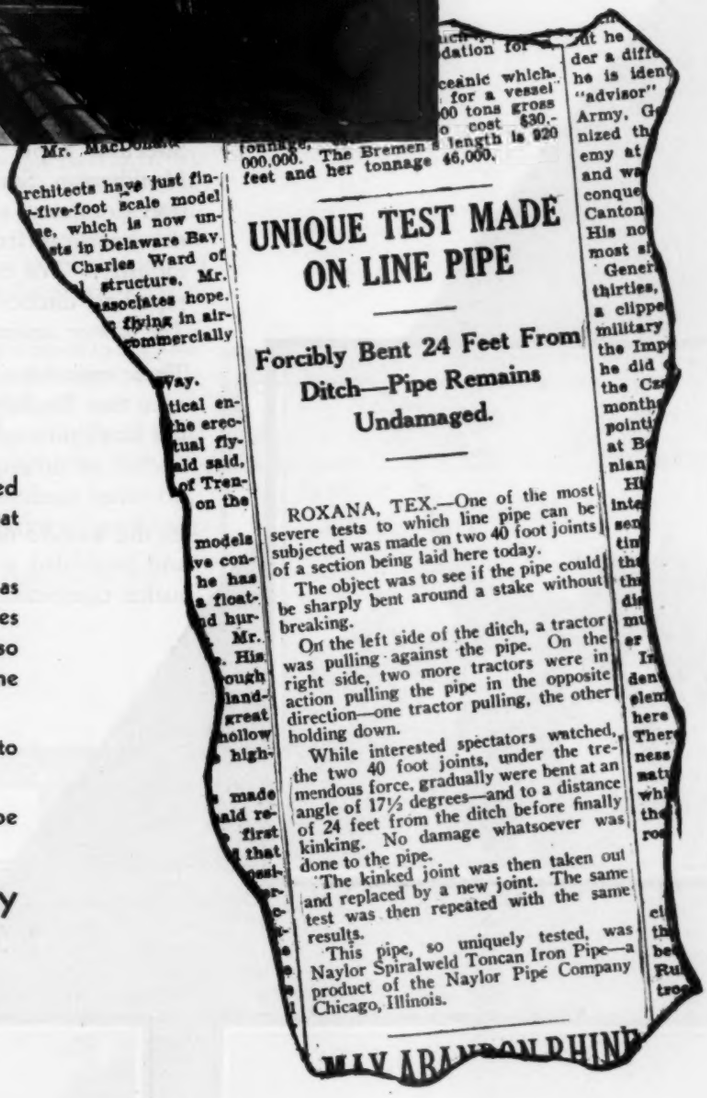
TALS INCORPORATED

OKLAHOMA. BOX 1938 TULSA



OKLAHOMA NATURAL GAS CORP.'S PIPE LINE SYSTEM





Mr. MacDonald

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UNIQUE TEST MADE ON LINE PIPE

Forcibly Bent 24 Feet From Ditch—Pipe Remains Undamaged.

ROXANA, TEX.—One of the most severe tests to which line pipe can be subjected was made on two 40 foot joints of a section being laid here today.

The object was to see if the pipe could be sharply bent around a stake without breaking.

On the left side of the ditch, a tractor was pulling against the pipe. On the right side, two more tractors were in action pulling the pipe in the opposite direction—one tractor pulling, the other holding down.

While interested spectators watched, the two 40 foot joints, under the tremendous force, gradually were bent at an angle of 17½ degrees—and to a distance of 24 feet from the ditch before finally kinking. No damage whatsoever was done to the pipe.

The kinked joint was then taken out and replaced by a new joint. The same test was then repeated with the same results.

This pipe, so uniquely tested, was Naylor Spiralweld Toncan Iron Pipe—a product of the Naylor Pipe Company Chicago, Illinois.

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3 Reasons Why

more and more companies are choosing Naylor Pipe for their pipe line service:

1. STRENGTH: Made with an electric welded spiral lock-seam which provides a truss of great strength.
2. LIGHT WEIGHT: Weighs only half as much as standard weight wrought pipe yet carries the same working pressures. Light weight also means lower handling costs and speedier line laying.
3. PERMANENCY: Made of Toncan Iron to resist rust and corrosion.

Consider these advantages and use Naylor Pipe on your next line.

NAYLOR PIPE COMPANY

Main Office and Plant, 1230 East 92nd Street, Chicago

Sales Offices:

New York, 25 Church Street
Philadelphia, Witherspoon Building
Detroit, 1500 Cadillac Sq. Bldg.
Tulsa, 507 Philtower Building
Houston, 601 Post Dispatch Building

DUCOMMUN CORPORATION

Los Angeles, California
San Francisco, Arizona, Nevada and Utah

Exclusive Distributors:

Montreal, Canada: Mechanical Equipment Company, New Birks Building

TONCAN Naylor Pipe

Mo-lyb-den-um IRON

Standardized Naylor Pipe is made in sizes 6" to 12" I. D. and 14" to 20" O. D. in any uniform length desired up to 40' 0". Ends made to wrought pipe standards for all types of coupling.

Where corrosion resistance is not a factor, Naylor Pipe can be furnished in steel.

Toncan Copper Molybdenum Iron is a development of Central Alloy Steel Corporation, the world's largest and most highly specialized alloy steel producers. It possesses a superior corrosion resistance, making it the favored pipe material.

WILLIAMS BROS. INC.

WHEN one of the world's foremost pipe-line contractors, who has already purchased over 60 Buckeyes, wires for more—it is positive proof that this equipment is thoroughly dependable and profitable.

Answering the roll call of Buckeye users, along with Williams Brothers, Incorporated, are the Oklahoma Contracting Company, Hope Engineering Company, Sheehan Pipe Line Construction Company, E. A. MacPherson, Smith Brothers, Truman-Smith Construction Company, and many others. They have followed the business from infancy to a giant of American industry. For over thirty years, Buckeye—the *original* pipe-line ditcher—has kept faith with their progress. *The pioneer continues to be the leader.*

These enthusiastic owners know from successful experience that Buckeyes can be relied upon to go "down the line" through good or bad soils, heat or cold and up hill or down, with a speed and operating economy no other method can approach.

In the world's oil and gas fields, more pipe is buried and backfilled with Buckeyes than with all competitive makes combined.

Wire for More

Briefly, these are a few of the reasons why Buckeyes render *"superior performance in oil field requirements"*:

Pipe-Line Ditchers—built in a complete range of sizes, each having its field. Standard construction includes heavy-duty, four-cylinder power unit of ample size; Alligator traction with brakes for steep grade work; steel construction throughout; digging wheel heavily built and double driven through a differential; combination buckets for every soil condition; and power control for every operation.

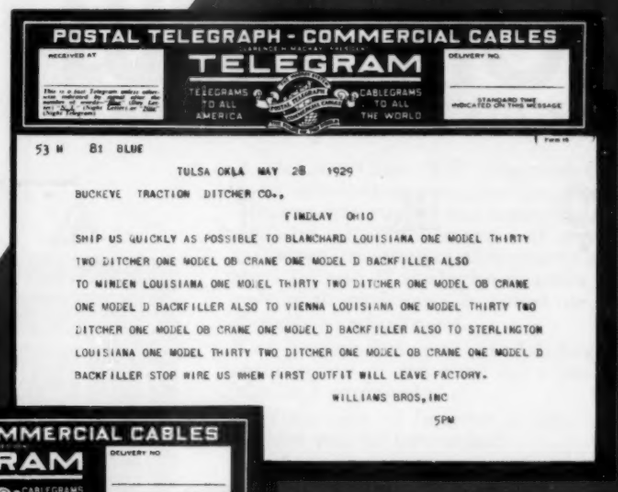
Utility Backfiller-Crane (full-revolving)—quickly converted, without drum lagging, from Backfiller to Crane, Clamshell or Dragline. Equipment includes two speeds for every operation through enclosed transmission; full-length Alligator traction; Twin Disc reversing clutches; all machine-cut gears, heat-treated; chrome nickel heat-treated and ground shafting; and Timken roller bearings.

Model D Backfiller (semi-revolving)—strictly a one-man machine, built to handle large yardage at low cost. It is often used as a light crane for handling pipe into the ditch, etc.

Model F Backfiller—a light, speedy, compact unit for the back-filling of pipe-line ditches. Low in original and maintenance cost.

Write for complete descriptive data

THE BUCKEYE TRACTION DITCHER COMPANY
FINDLAY, OHIO
There's a Buckeye Sales and Service Office near You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TELEGRAM

TELEGRAMS TO ALL AMERICA — CABLEGRAMS TO ALL THE WORLD

53 N 81 BLUE

TULSA OKLA MAY 28 1929

BUCKEYE TRACTION DITCHER CO.,

FINDLAY OHIO

SHIP US QUICKLY AS POSSIBLE TO BLANCHARD LOUISIANA ONE MODEL THIRTY TWO DITCHER ONE MODEL OB CRANE ONE MODEL D BACKFILLER ALSO TO MINDEN LOUISIANA ONE MODEL THIRTY TWO DITCHER ONE MODEL OB CRANE ONE MODEL D BACKFILLER ALSO TO VIENNA LOUISIANA ONE MODEL THIRTY TWO DITCHER ONE MODEL OB CRANE ONE MODEL D BACKFILLER ALSO TO STERLINGTON LOUISIANA ONE MODEL THIRTY TWO DITCHER ONE MODEL OB CRANE ONE MODEL D BACKFILLER STOP WIRE US WHEN FIRST OUTFIT WILL LEAVE FACTORY.

WILLIAMS BROS, INC

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TULSA OKLA JULY 15 1929.

BUCKEYE TRACTION DITCHER CO,

FINDLAY,OHIO

AM MAILING YOU TODAY PHOTOGRAPHS REQUESTED SHOWING OPERATIONS OF MACHINES PURCHASED FROM YOU MAY TWENTY EIGHTH STOP ALL THESE MACHINES HAVE BEEN RUNNING APPROXIMATELY TWENTY FOUR HOURS PER DAY CONTINUOUSLY SINCE ARRIVAL ON THIS JOB WITH NO COMPLAINTS TO DATE

G C SWARTZ
MECHANICAL SUP'T
FOR WILLIAMS BROS, INC.

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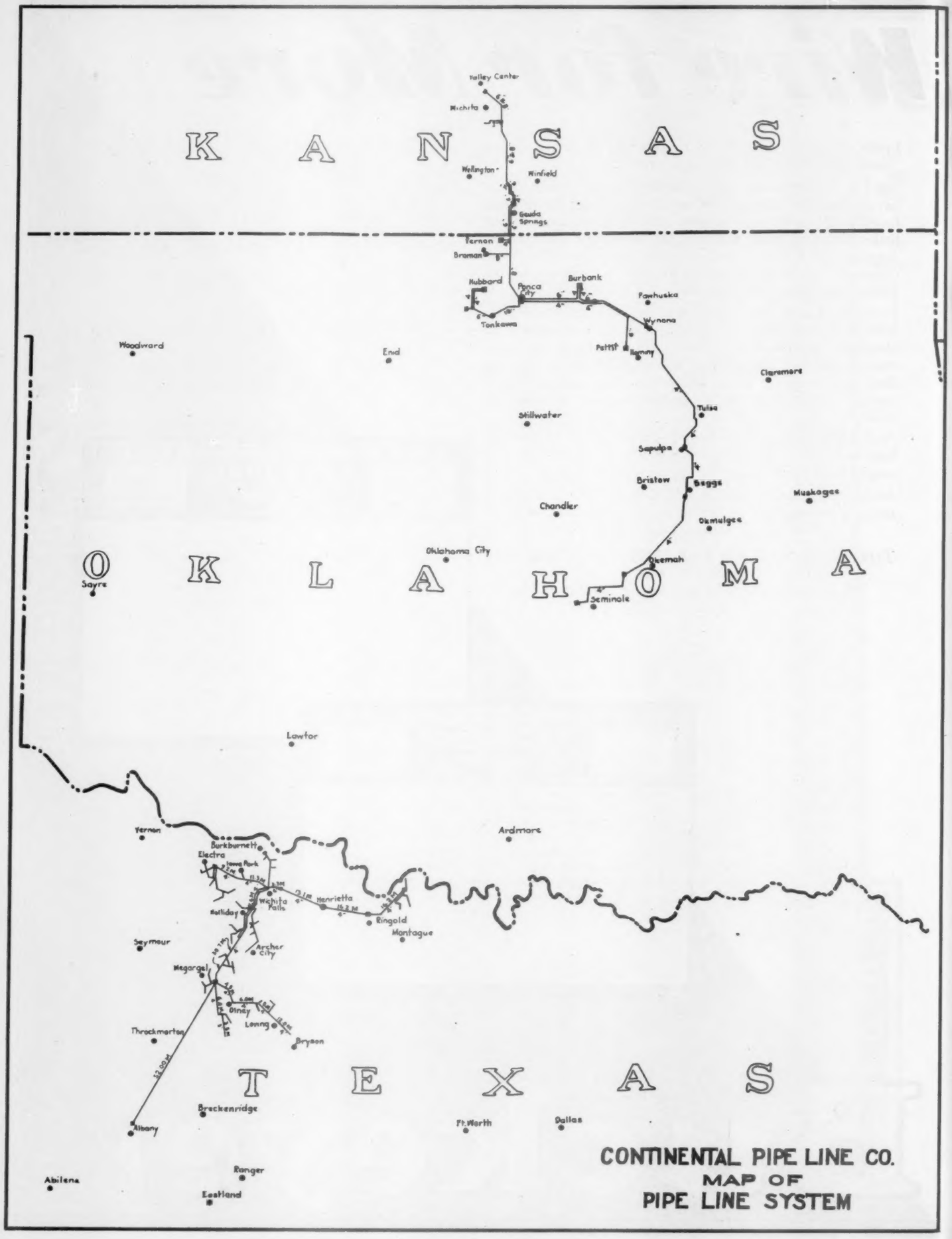
for over thirty years
Buckeye


KANSAS
Valley Center
Wichita
Wellington
Winfield
Eauda Springs
Vernon
Braman
Hubbard
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Burbank
Pawhuska
Wynona
Tonkawa
Pettit
Henry
Claremore
Woodward
Enid
Stillwater
Tulsa
Sapulpa
Bristow
Beggs
Muskogee
Chandler
Okmulgee
Oklahoma City
Okemah
Seminole
Sayre
OKLAHOMA
Lawton
Vernon
Ardmore
Burkburnett
Electra
Iowa Park
Wichita Falls
Henrietta
Holliday
Ringold
Montague
Seymour
Archer City
Megargel
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Loving
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CONTINENTAL PIPE LINE CO.
MAP OF
PIPE LINE SYSTEM

McCORD

CLASS "LF"

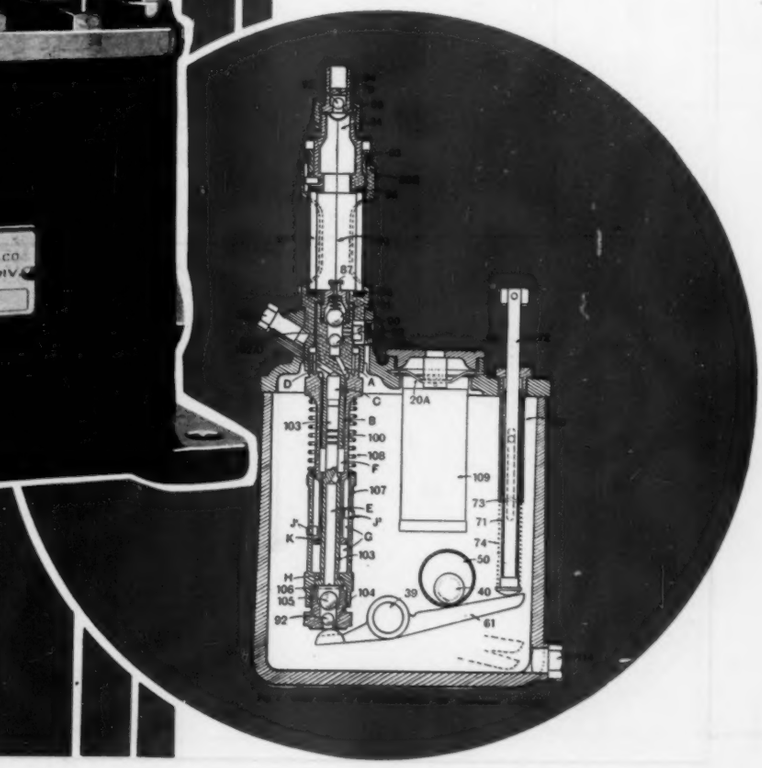
MECHANICAL LUBRICATORS

STANDARD OF THE OIL FIELDS

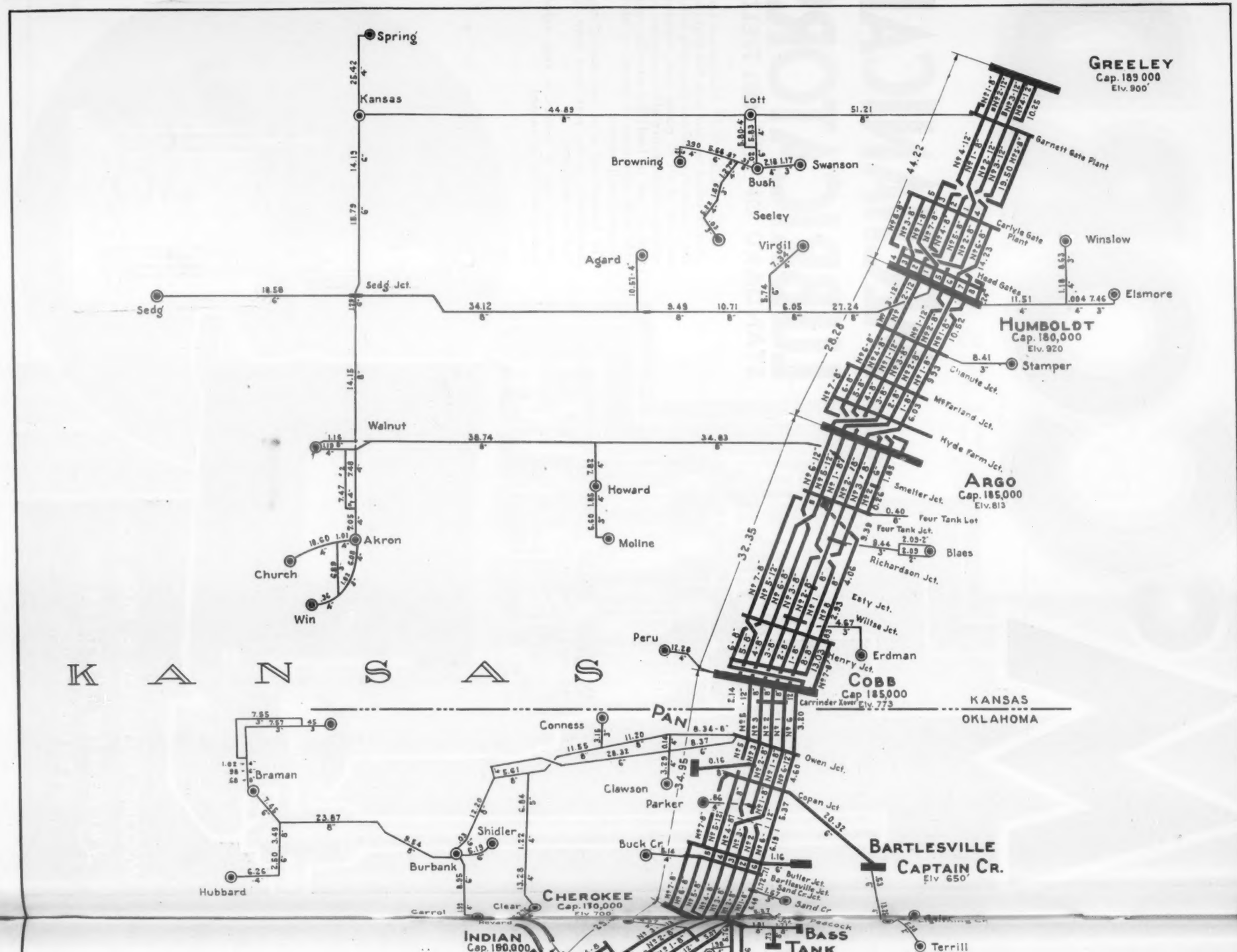
A McCord Class "LF" Mechanical Lubricator installed on your pipe line engines assures uninterrupted and absolutely uniform delivery of oil to power and compressor cylinders irrespective of temperature, pressure, or rate of feed; the quantity varying only with variations in speed, or manual changes in adjustment.

The largest and most outstanding engine installations of the year have been 100% McCord equipped.

At your sign of interest a very valuable booklet will be forwarded.



McCORD RADIATOR & MFG. CO.
Lubricator Division
DETROIT MICH.


KANSAS
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Carlyle Gate Plant
Winslow
Head Gates
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Chanute Jct.
McFarland Jct.
Hyde Farm Jct.
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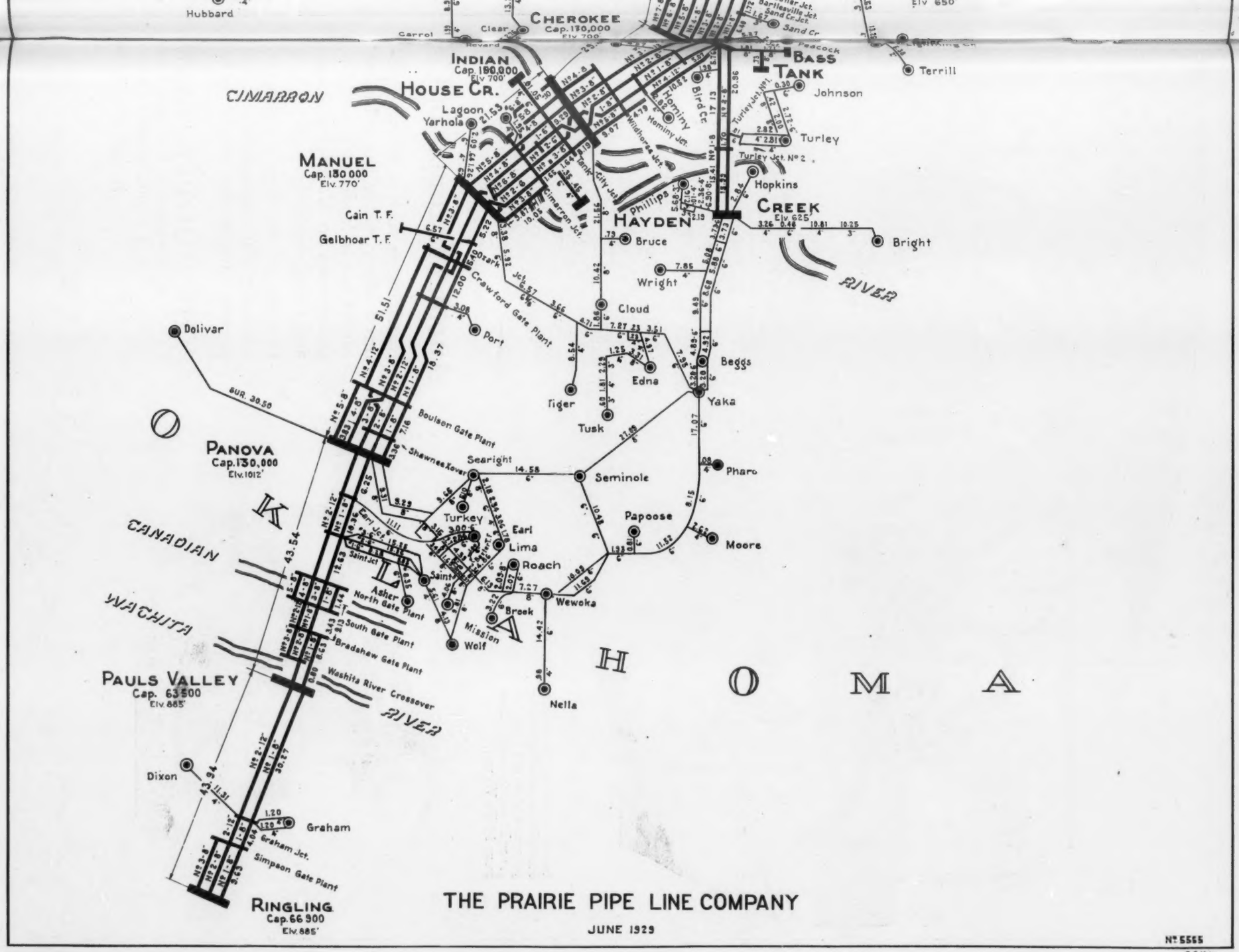
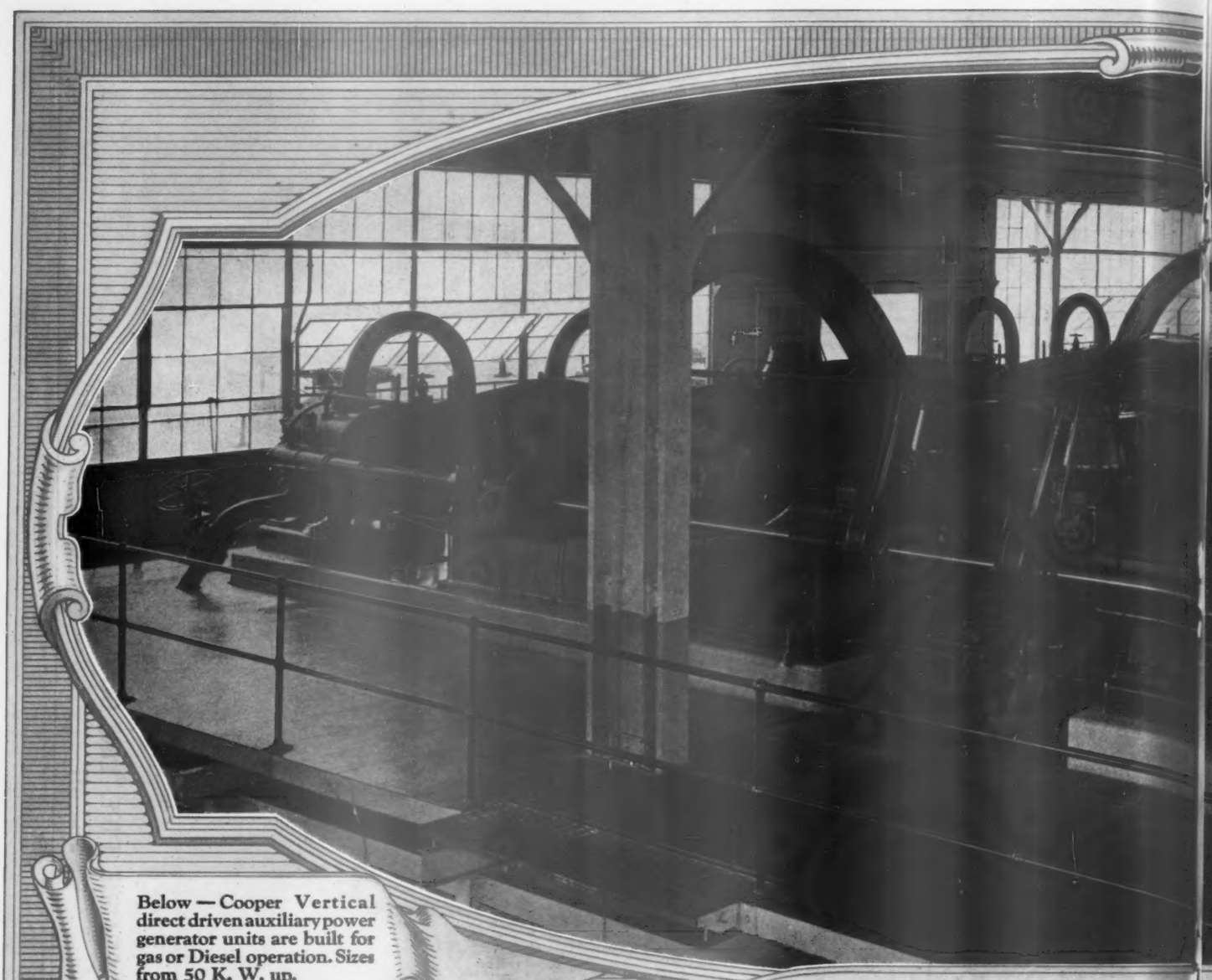


THE PRAIRIE PIPE LINE COMPANY

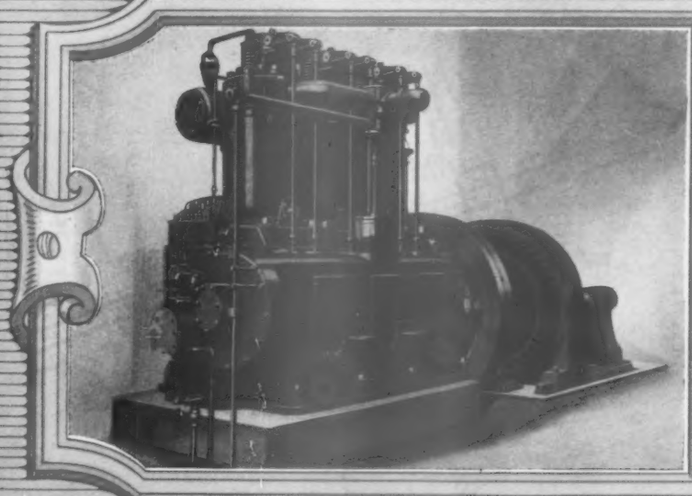
JUNE 1929

No 5555

E. E. Kors



Below — Cooper Vertical direct driven auxiliary power generator units are built for gas or Diesel operation. Sizes from 50 K. W. up.



Another Example of Con fid

Installations, such as the one pictured above, show the complete confidence of leading Gas and Oil Companies in Cooper Engines and Compressors.

Because of the large investment necessary, the engines for a Compressor Station are bought only

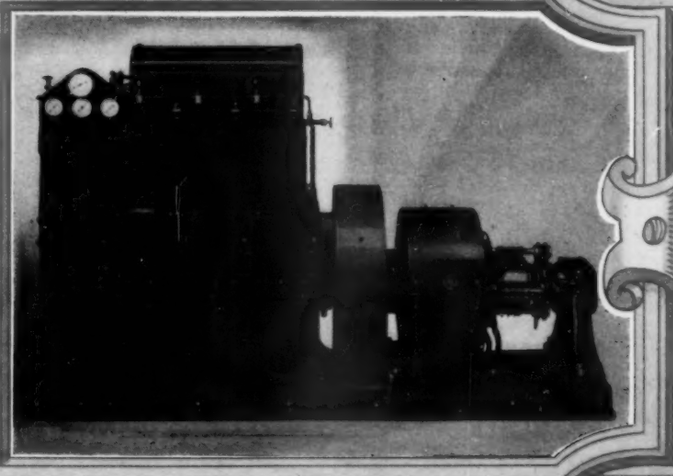
THE COOPER-BESSE M
Formerly The C. & G. Cooper Company and T
Mount Vernon, Ohio
Branches in all princi pal

Below—This Bessemer Diesel direct driven electric generator set is built for auxiliary service. Sizes from 50. K. W. up.

fidence in Cooper Engines

after a thorough investigation.

It is this extreme caution in buying which decides so many orders for Cooper Engines and Compressors.



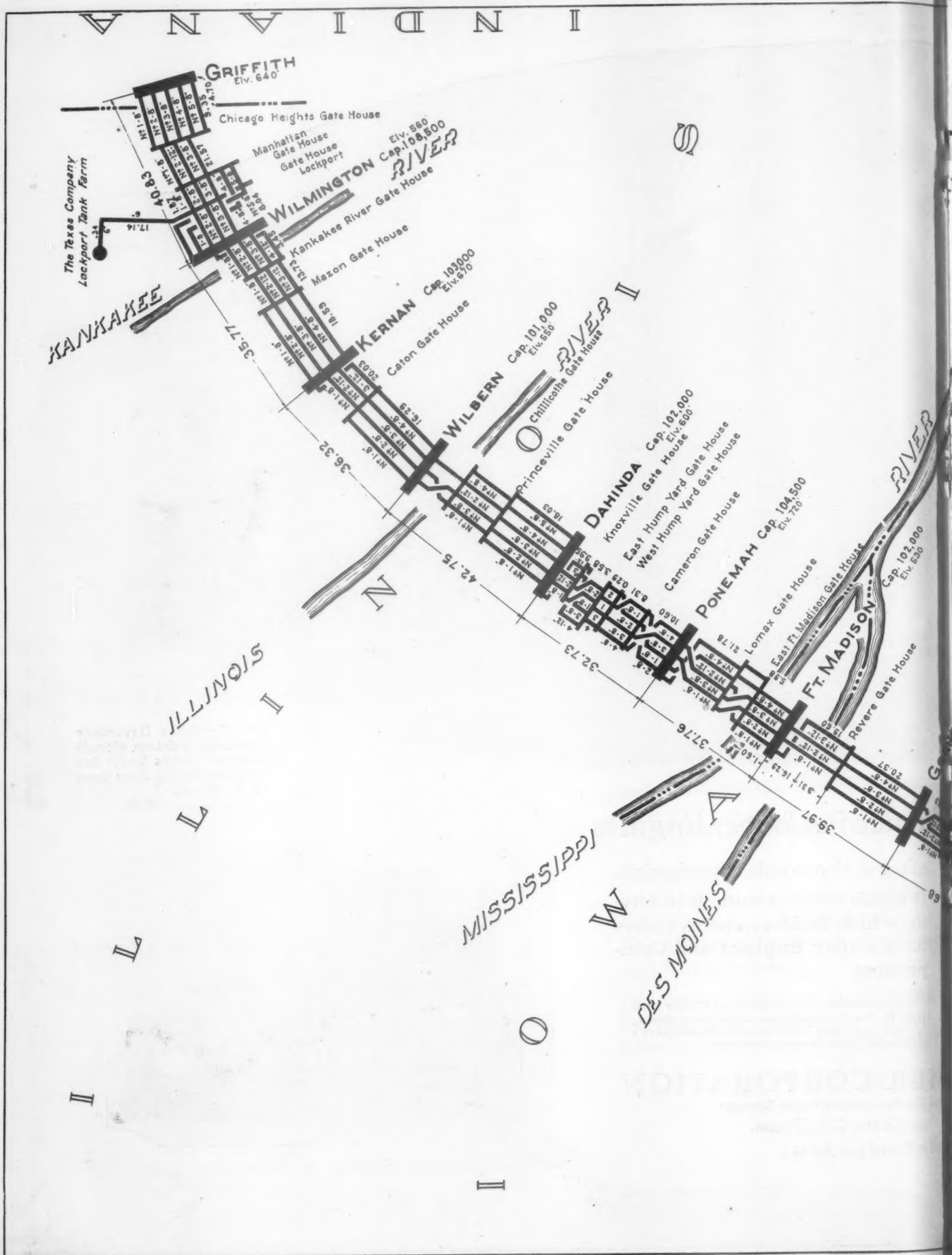
The illustration above shows three Cooper 1000 B. H. P. twin tandem gas engines direct driving Gas Compressors in the Magnolia Gas Company's Mineola, Texas compressor station.

MER CORPORATION

and The Bessemer Gas Engine Company

Grove City, Penna.

pal oil and gas fields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GRIFFITH
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Chicago Heights Gate House
Manhattan Gate House
Gate House
Lockport
WILMINGTON
Cap. 108,500
Elv. 560
RIVER
The Texas Company
Lockport Tank Farm
Kankakee River Gate House
Mazon Gate House
KANKAKEE
KERNAN
Cap. 103000
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Caton Gate House
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Princeville Gate House
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Knoxville Gate House
East Hump Yard Gate House
West Hump Yard Gate House
Cameron Gate House
PONEMAH
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Lomax Gate House
East Ft. Madison Gate House
FT. MADISON
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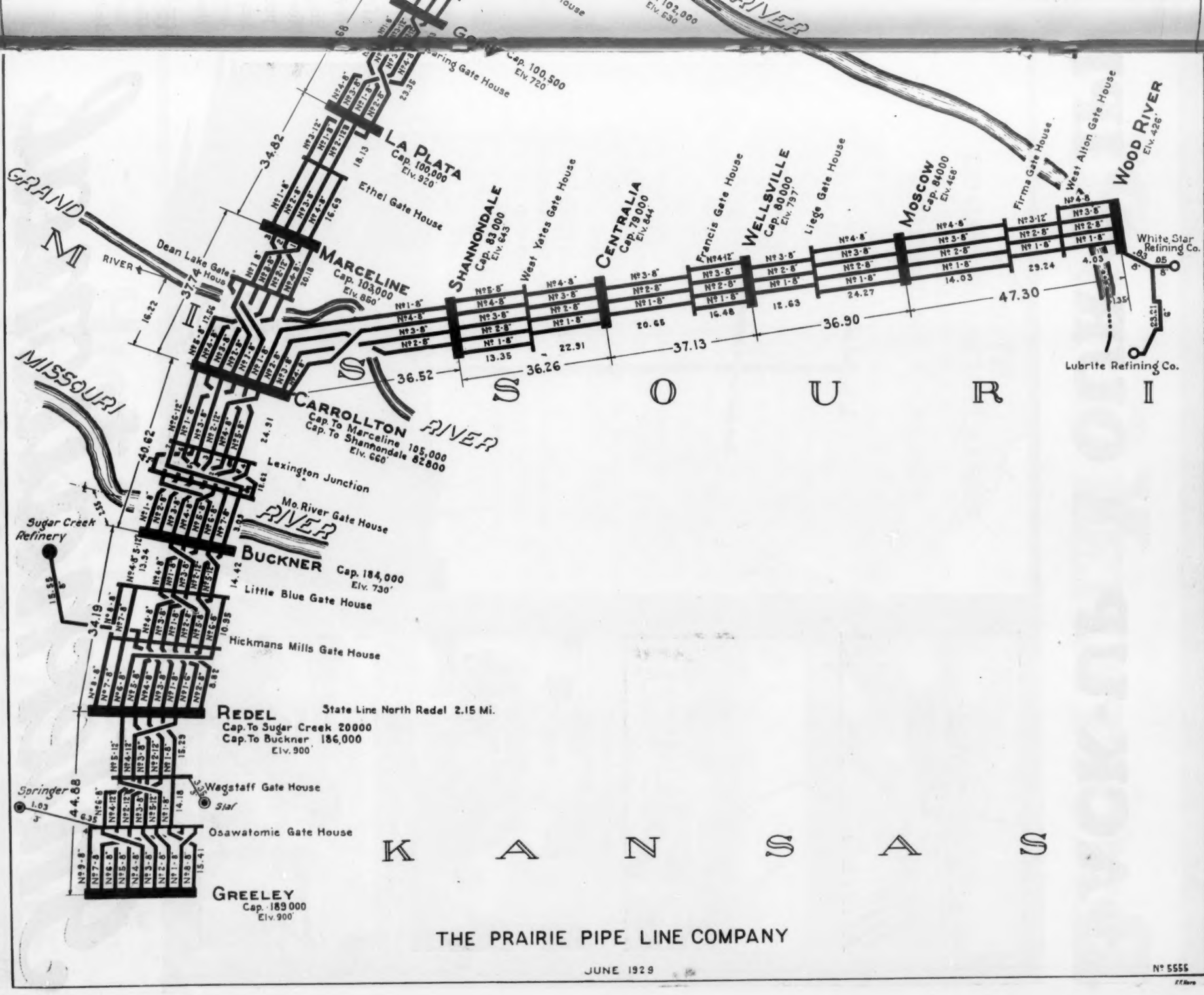

THE PRAIRIE PIPE LINE COMPANY

JUNE 1929

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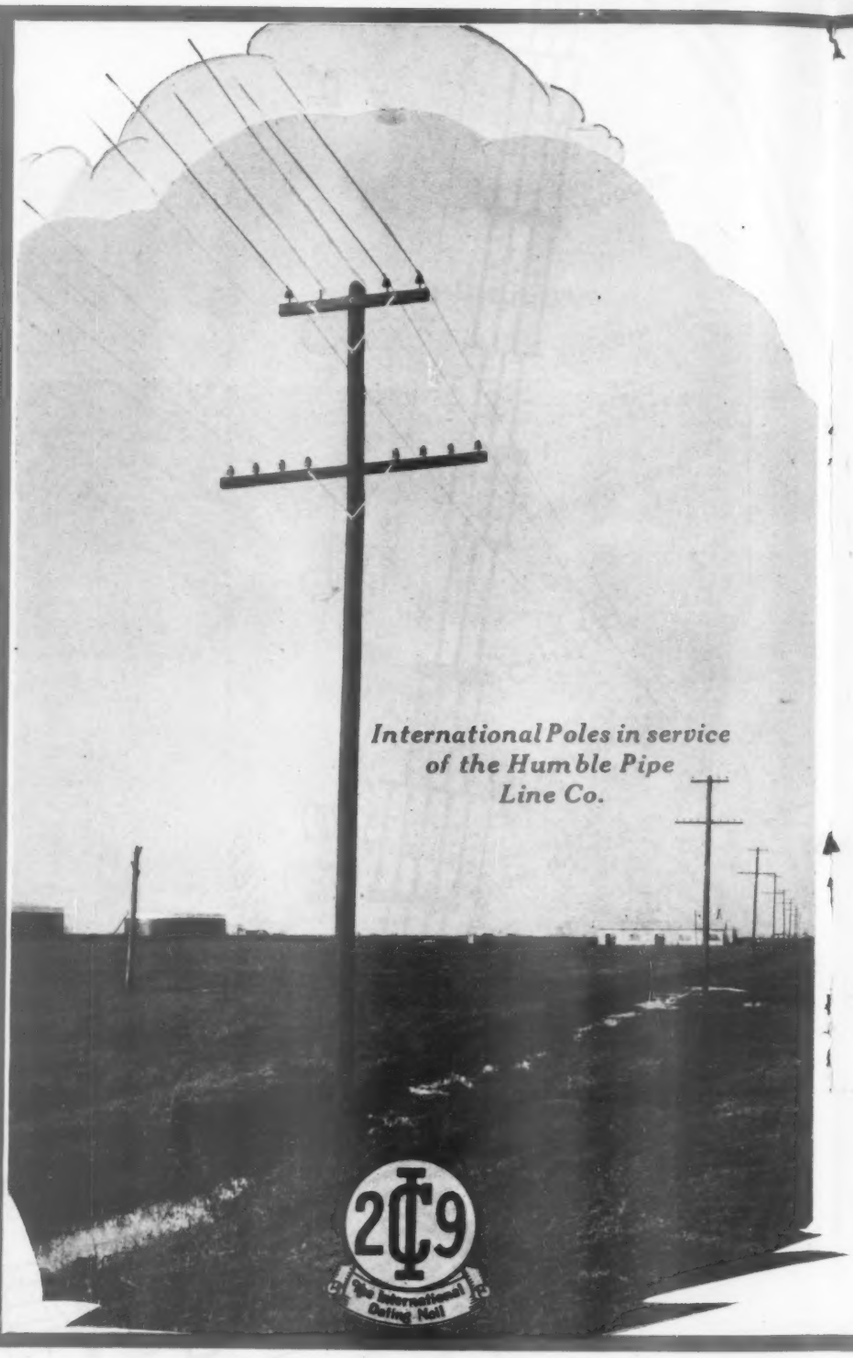
BACK-UP YOUR PIPE

Proper Seasoning

Proper Stacking

Chemical Supervision

Extra Large Poles



International

E LINE OPERATIONS–

WITH COMMUNICATION LINES THAT ARE STRONGEST LONGEST

USE *International* Creosoted Pine Poles for your telephone, telegraph and power lines. You will then have poles that are strongest longest, also greatest insurance against pole breaks which interfere with the continuity of electric power supply and communication service.

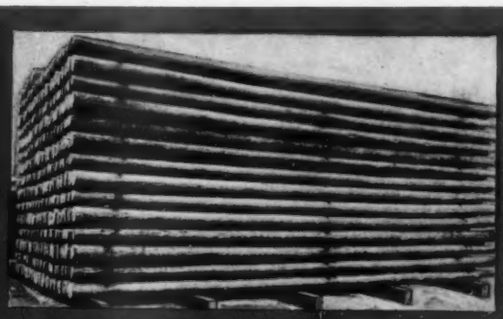
The quality policy of *International* places time-tested, reliable poles at the disposal of all engineers who desire the utmost in pole line strength, durability and freedom from pole breaks. All this with the economy of long life, low maintenance and an uninterrupted service.

International inserts a galvanized iron dating nail in every pole, assuring the purchaser an A-1 pole in every respect. *International* poles do last. Thousands have been in service 20, 25, 30 years and still in excellent condition.

International's large stock makes possible the prompt shipment of high quality poles accurately framed to any specification and scientifically treated under technical supervision.

Large and small orders carefully executed

International Creosoting & Construction Co.
General Offices—Galveston, Texas
Plants: Texarkana Beaumont Galveston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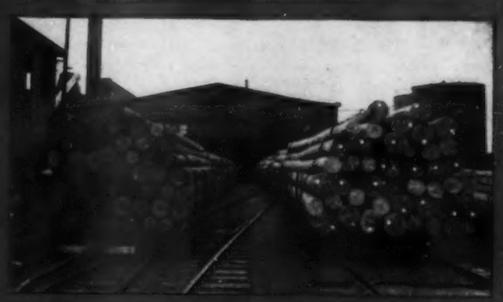
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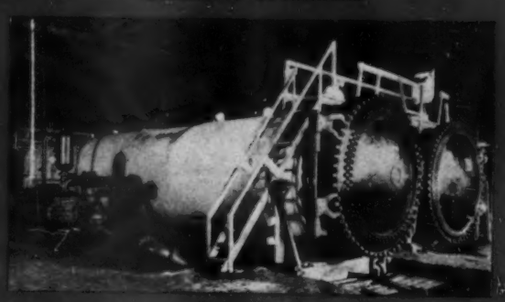
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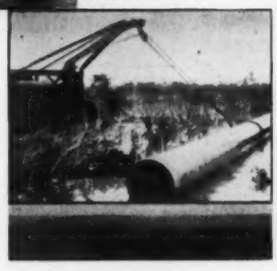

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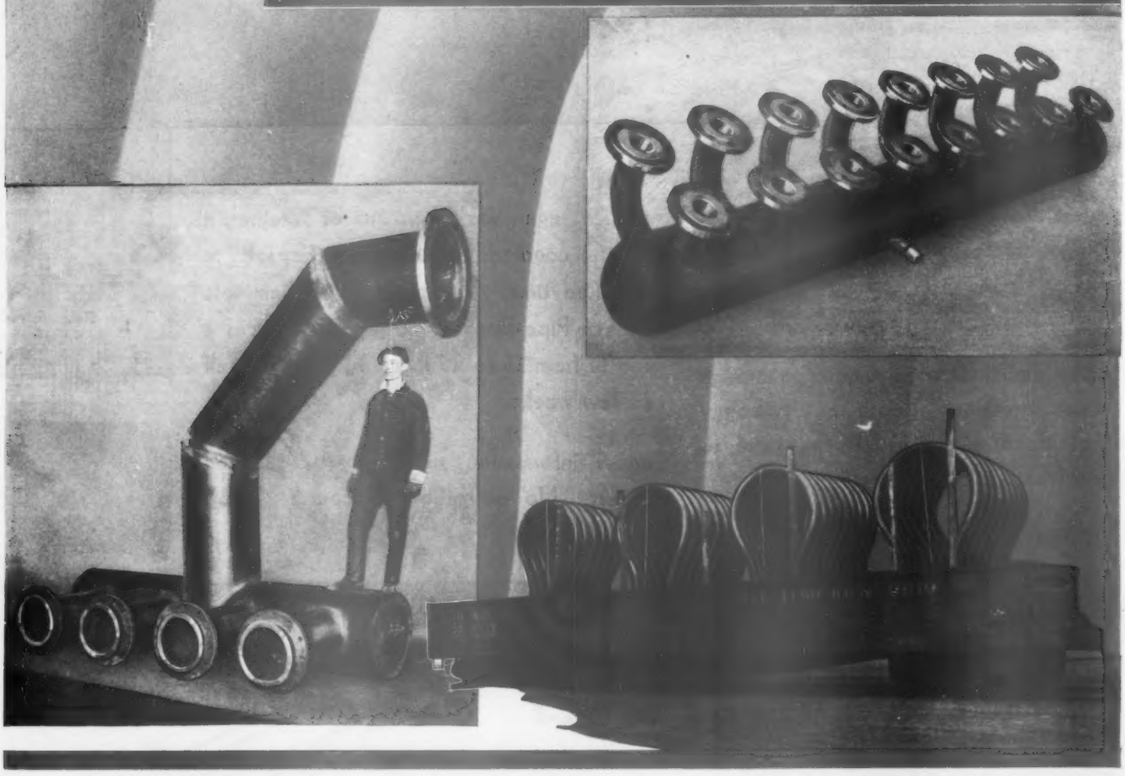

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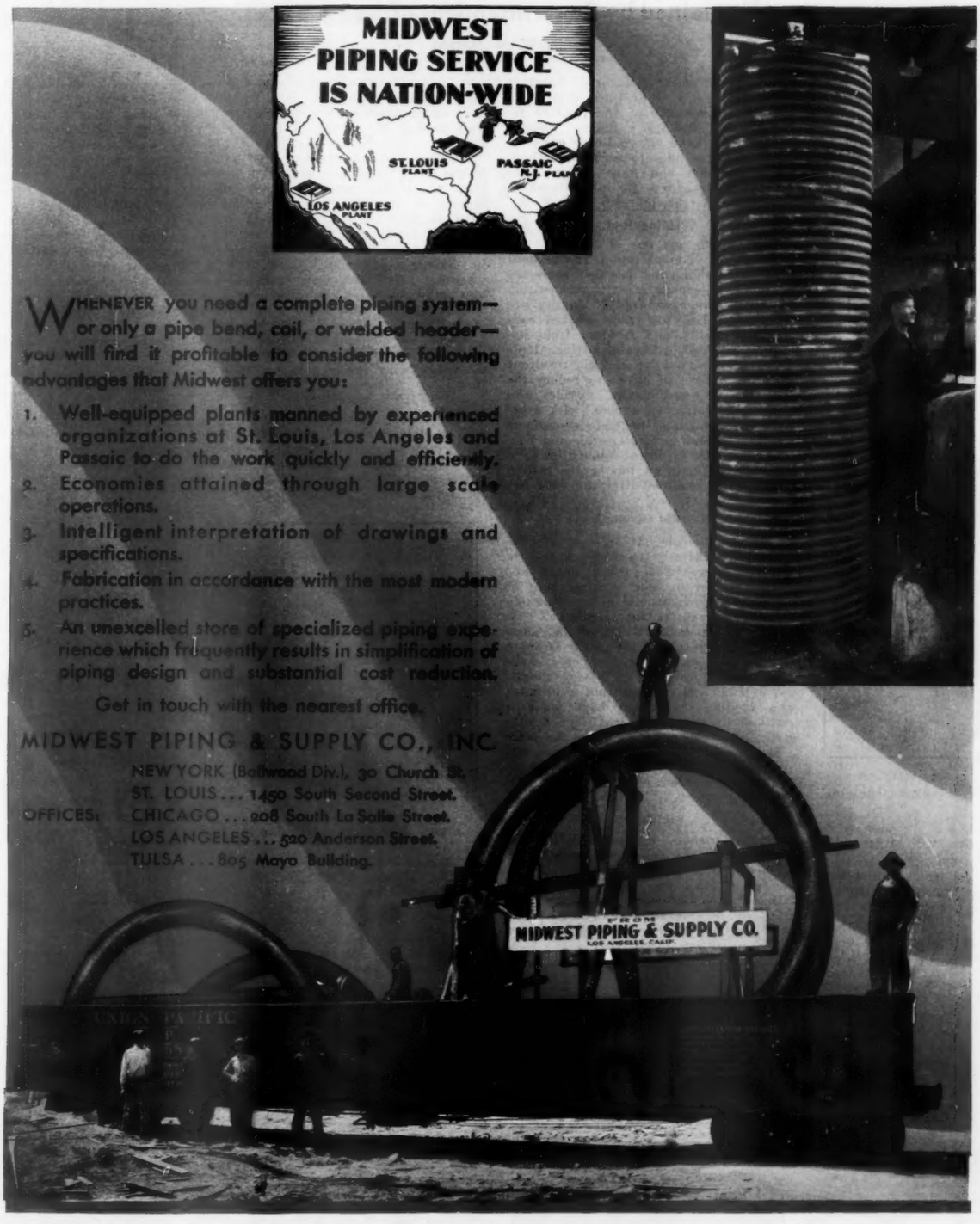
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Past and Future of Electric Welding

Advantages and Disadvantages Are Pointed Out and Explained by Superintendent of Long Experience

By W. M. Murphy
Superintendent, Magnolia Pipe Line Co.

Electric welding is a comparatively new method in the construction of steel pipe lines. A 7-inch bell and spigot, arc welded pipe line, 45 miles in length, between Lamkin and Hodge, La., finished in December, 1927, to carry from 600 to 1,000 pounds flowing gas pressure, was reported to be, at that time, the longest arc welded pipe line in the world.

Since its introduction, a little more than 10 years ago, electric welding has rapidly grown in use. In shops, mills, refineries and industrial plants where power was cheap and easily available and where the original faults of electric welding could be tolerated this method of welding was adopted. Pipe line engineers, following the traditional policy of the pipe line industry, to avoid investment in fads, were among the last to

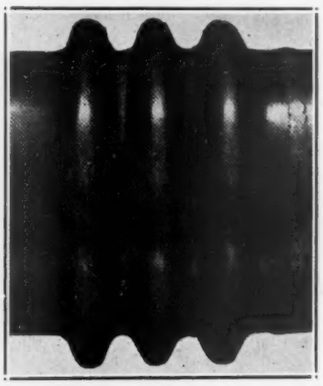


Figure 1—Long flexible expansion joint.

accept this method, but are now giving it equal consideration with other, older methods of construction.

The original faults claimed, and most of the claims justified, for electric arc welding of pipe lines, were as follows:

Prohibitive cost.
Inconsistent quality of welding rod.
Low tensile strength of welds.
Brittleness of welds.
Porosity of welds.
Equipment unsuitable for field use.
Scarcity of highly qualified welders.
Inability to make "tie-in" or overhead welds.
Line too stiff for large diameter construction.
Unsatisfactory welded joint design.
Impractical field welding operations.

Cost

Starting with the first fault, that of prohibitive cost, this condition usually exists at the beginning of any new industry. The first equipment was hand built by specially trained mechanics, because rapid changes and improvements prevented standard design, and lack of demand prevented quantity production. The increased demand for electric welding has produced standardized equipment, and welding rod is advertised under trade names and manufactured with quantity production methods. Some of the first electric welded lines showed high costs for amortization of equipment because they were short experimental sections. Electric welding equipment is at present comparatively expensive but the amortization cost is low on its welding capacity. To reduce amortization and interest costs per weld, the equipment must be kept continuously at work. Welding of all forms has been favored, where it has been used on pipe lines, even at a higher cost, because of the positive reduction of leakage. Recent electric welded lines have shown lower costs on small diameter lines than other methods of construction and have shown costs approximately equal to other methods on lines of larger diameter.

Welding Rod

The second, and one of the most serious of the original faults, inconsistent quality of welding rod, has been corrected by the development of stiff competition in this field. Standards of quality are being advertised for trade marked rods and the quality and freedom from impurities guarded by careful testing. Rods are being designed for specific resultant weld properties; of alloys to reduce the inclusion of gases, exides, nitrides and solid nonmetallic substances, with coatings to product a neutral atmosphere around the molten weld metal, and containing a flux to absorb impurities in a slag, which floats on top of the molten metal easily removed after the weld has cooled.

Tensile Strength

The low tensile strength of electric welds has been effectively corrected. This fault was not serious in flexible connections or in short straight runs of pipe, where expansion and contraction strains were not potent factors. A few years ago, a weld, which would show under "pull" test, half the tensile strength of the pipe stock was considered satisfactory. Improvement in types of joints, as well as of welding rod, equipment and welding operations, have made it possible to produce a majority of pipe welds of greater strength than the plain pipe stock. Welding companies are prepared and willing to guarantee a minimum weld strength 80 per cent of that of the pipe stock.

Brittleness

The brittleness of electric welds has been the fault which has had the most influence in delaying the acceptance of electric welding for main line construction by pipe line engineers. Pipe foremen, whose reputations and salaries depend on their familiarity with old methods in use, and who, for that reason, are naturally opposed to new methods, have exaggerated conditions, when welds were broken by cutting skids in lowering and other rough handling of pipe. "The line broke before we could get it in the ditch," has been heard on welded lines which later proved entirely satisfactory in operation. It would not be hard to find similar failures in other kinds of joints that were dropped from lowering horses or not properly blocked in making cold bends. This fault at its worst was highly exaggerated and is now reduced to an indication of poor welding operation or lack or qualification of individual welders. Accurate specifications, careful inspection and periodic tests will remove the possibility of brittle welds being included in a completed line.

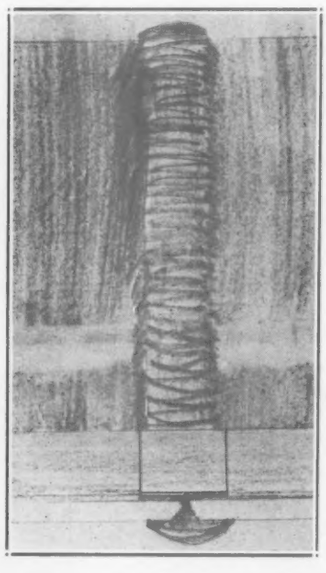


Figure 2—Butt weld with back-up ring.

Porosity

The porosity of the electric welds was very troublesome when this method first came into use. Around refineries, compressor stations and industrial plants, where sections of pipe could be isolated for repair without crippling operations,

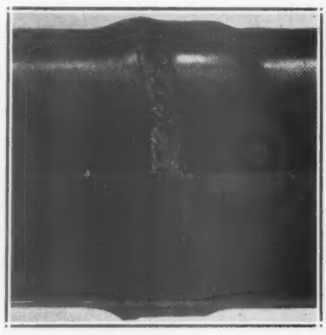


Figure 3—"Smithweld" pipe joint.

this fault could be tolerated. On main lines, a pinhole leak, although not at first troublesome, usually developed into serious trouble before repairs could be made. A shut down for repairs represented complete paralysis of the system as well as loss of gas or oil from the section which had to be repaired. The cause of the porosity was primarily poor welding rod, coupled with inexperienced welders, and welding heats too low for satisfactory deposit of material. Welding rods in present use are designed to prevent porosity and pinholes by reduction of gases in the molten weld, and deposit at temperatures which reduce the possibility of crystals in the completed weld. By making the weld the positive pole of the arc, the top of the molten weld was made hotter than the bottom, permitting the included gases to escape.

Welding Equipment

The first welding equipment was built for shop use. It was entirely unsuitable for field use because of its weight and its inability to stand the hardship of movement along pipe line rights of way. Recent changes in equipment have reduced the weights of power units and generators, provided better mountings, and made it possible for this equipment to be moved over any kind of ground that other motor equipment in use on pipe lines can cover. Also the generators are sufficiently sturdy to stand varying loads and other conditions of pipe line welding.

Welders

The first arc welders were trained for shop work, and for that reason the experienced welders could not be induced to follow pipe line construction. Welders are now being trained by pipe and equipment manufacturers, exclusively, for pipe line work. Portable welding machines are being maintained by pipe line companies as a part of their operating equipment with the result that men who follow the business and who are naturally fitted for the work are taking it up and adding to the number of good welders available. Better and more experienced foremen are available who are capable of better selection of men. Improvements in methods for testing of completed work has made it possible to weed out unqualified workers. In this regard, attention may be called to the fact that the standards of workmanship in all forms of pipe line work are becoming higher and the pipe line worker, like the carpenter or tinsmith, must be specially fitted for his work. A large part of the credit for this condition is claimed by the introduction of welding, with its highly specialized workmen, in pipe line construction.

Tie-in Welds

A handicap to the all-electric welded line was the delay in the development of welding operations which would produce a satisfactory overhead weld and of welders capable of doing this work. On "tie-in" or "bell-hole" welds, where the welded pipe sections are connected to the completed continuous tube, and where the pipe cannot be rolled during the welding operation, this type of welding is necessary. There are now many expert welders qualified for this work and by change of welding heat and the use of one or more additional passes or layers of deposited metal than used in the "roll weld" operation, welds are produced of equal quality to "rolled welds."

Stiffness

A continuous butt welded tube is much stiffer than a line built with flexible joints, and for that reason, is more vulnerable to shearing and torsional strains. Slack and bends can be provided to offset these strains on small lines, but on lines of large diameter, the stiffness makes handling clumsy, and slack, if provided, is often lost in handling during

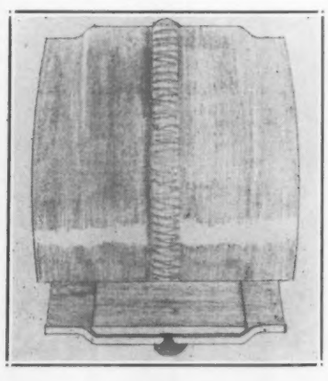
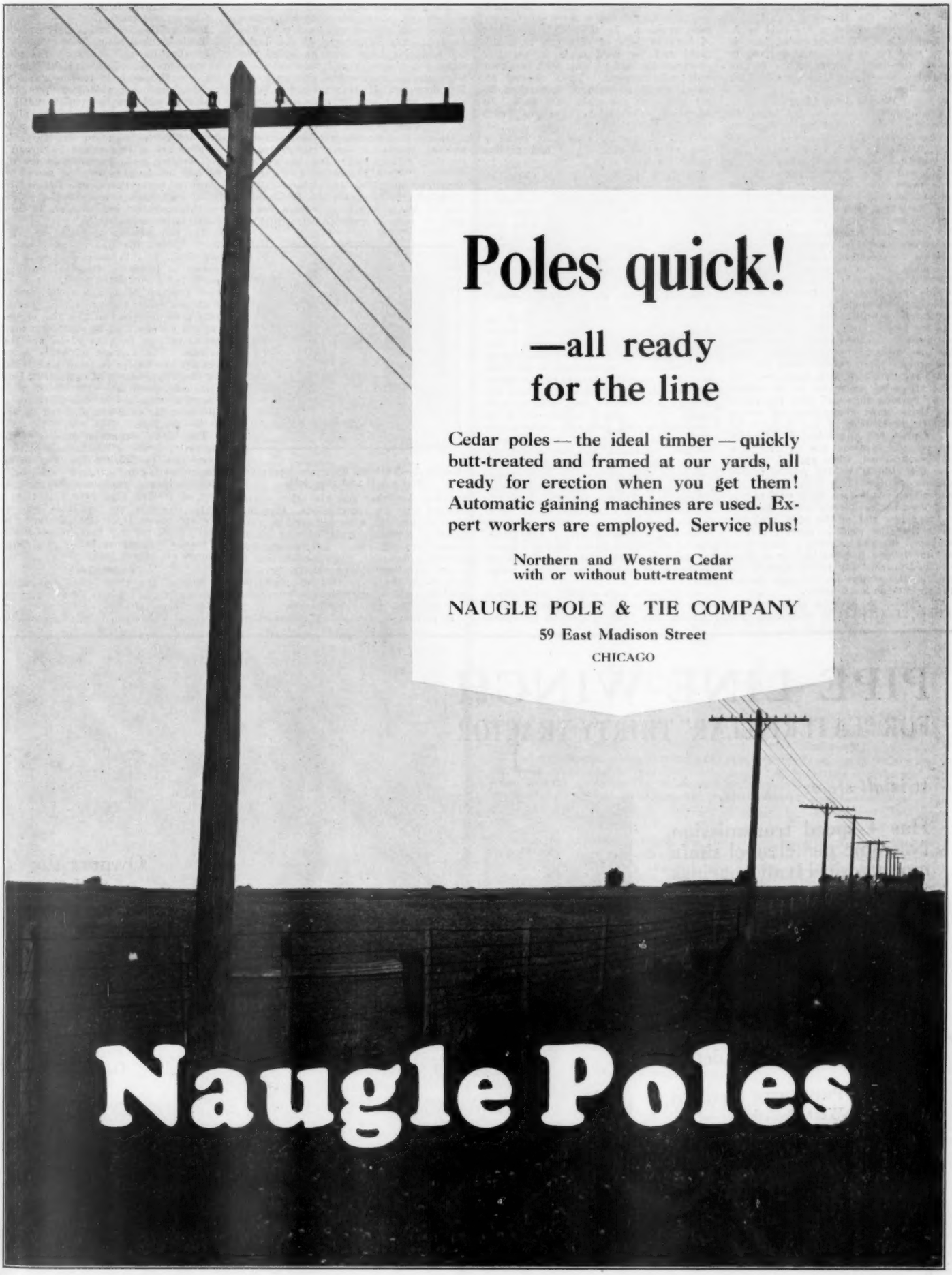


Figure 4—Magnolia double bell and ring joint.

painting and lowering operations. A flexible expansion joint was built in 1925, in accordance with a design by Fred M. Lege, Jr., and although test and experiment showed that it would meet this difficulty, its cost of manufacture for use in large diameter lines appeared prohibitive. In 1928, manufacture of this expansion joint (Figure 1) was developed by A. O. Smith Corp. and incorporated in the first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20-inch, all-electric welded natural gas line built for the Magnolia Gas Co. in Louisiana, and welded in the field by A. O. Smith Corp. This expansion joint is being used for an additional purpose to replace fire bends, an expensive feature formerly considered inseparable for welded lines.

Welded Joint Lines

The original type of welded joint, the plain butt weld, is giving satisfactory service in many miles of welded line and is unquestionably safe, if the welded line is laid in compression throughout its length, and placed in the ditch so that it rests evenly on the bottom, free from torsional and shearing stresses. To provide these conditions on long straight lines, expensive right of way preparations, favorable weather conditions, and perfect workmanship, supervision and inspection are required, which on "hurry-up" main line construction jobs rarely exist. A particularly troublesome feature of this type of joint is that the molten weld drips through the welding space, forming hard projections or "icicles" inside the pipe, which later break off during operation of the line and travel down the line to cut out valve seats, compressor and pump valves, bends and fittings, and interfere with operation. The joint offers no protection to the welder from "burning through" with the result that the average welder does not secure complete penetration.

The plain bell and spigot joint, which has been in common use on cast iron pipe construction, when applied to steel pipe for electric welded joints, proved superior to the plain butt weld, particularly on small sizes. The weld in this joint does not completely pierce the weld of the spigot end of the pipe, with the result that the weld in operation must overcome shearing stresses. The joint in "line-up" or preparation for welding does not provide any safety against the irregularities of line-up, although the operation is made much easier.

By placing a back-up strip or ring (Figure 2) 3 inches in width, of thin sheet iron inside the pipe, underneath the plain butt weld, a more satisfactory joint resulted. In this joint, the edges of both sections of pipe can be easily fused and the weld made to partially penetrate the back-up ring, with resultant weld reinforcement. Tests showed an added tensile strength of more than 20 per cent over the plain butt weld. In operation, the joint interferes with straight line flow, but offers the advantage of ease of repair by reducing loss while wedging cracks and placing repair clamps.

In 1928 the A. O. Smith Corp., by adding a "welding dam" to the spigot end of the bell and spigot joint, produced a joint (Figure 3) which combined the qualities of the bell and spigot joint with those of the butt weld with back-up ring. This joint permits ease of "line-up" or preparation for welding, practically removes shearing stresses in the weld, reduces and offers greater resistance to torsional stresses, and presents a smooth interior for straight line flow.

In 1927 and early part of 1928 the Magnolia Gas Co. developed a double bell joint with internal supporting ring (Figure 4). The purpose of the internal ring was to fill the recesses of the bells, provide a smooth interior, reduce shearing and torsional stresses on the weld and produce a reinforced weld without additional welding costs. In preparation for welding, the ring acts as a guide to prevent irregular lineup, and in welding, it reduces "overriding" and other distortions which were common faults of the plain butt weld. The edges of the bells present surfaces of equal thickness for welding. If through unforeseen conditions, or faulty workmanship, a weld break should occur in operation, the ring would assist in preventing complete parting and distortion of the joint. In the case of a crack, the bells in relieving their strain, would tend to bind against the ring and reduce loss.

In the latter part of 1928, the National Tube Co. developed an improved double bell and ring joint (Figure 5) by adding a single corrugation around the middle of each bell to add flexibility and relieve contractional strains near each weld. The joint has the advantages of the double bell and ring joints with an added provision for expansion and contraction. It is being used on seamless pipe up to 12-inch diameter. If manufactured in larger sizes, it would be a valuable addition to joints used for main line construction.

Field Welding Operations

On the first electric welded lines, shop welding operations were transferred to the field without regard for changed conditions. "Weld production" was given precedence over "line completion." With other construction methods, the connection of joints had been worked out to mesh in even progression with ditching,

Figure 5—National Tube Co. improved double bell and ring joint.

painting, lowering and the other operations of pipe line construction. Pipe line construction will always have the variables of weather, right of way conditions, property owner interference and operating demands. The introduction of a new set of variables by electric welding met with the opposition of pipe line workers, which, until it was overcome, was reflected in completed costs.

In present electric welded construction, the work is divided into three operations:

Line-up and tacking.
Roll welding or "firing line."
Tie-in or "bell holing."

In the "line-up" operation the pieces of pipe are placed in straight line sections on flat skids in readiness for "roll welding" and spot welded or "tacked" so that they will remain in place until the welded joints are completed. The pipe is usually supported on the skids by rollers or "dollies" to make turning easy. The sections are as long as can be turned for roll welding, and, depending on the right of way as long as can be moved into place for connection to the finished line. With equipment now available, progress on this operation can be made to fit the construction organization.

The roll welding operation or "firing line" follows the line up as closely as practical. In this operation, two or more passes or bands of deposited metal are made for a completed joint. It is general practice to complete each section with one welder and generator. The current used, composition and size of welding rod are specified by equipment manufacturers, and in some cases, are trade secrets. The number of welds secured per day per welder on small pipe depends on ease of movement of equipment. Under fair conditions, an experienced welder should average better than 35 welds per nine-hour day on 8-inch pipe and 18 welds on 20-inch pipe.

The "tie-in" operation consists of moving the "roll-welded" sections in place for connection to finished line and making the connecting or "bell hole" weld. Equipment is in use, capable of dragging 400 feet of 20-inch pipe over fair right of way. Welders are available who can average better than eight 20-inch "bell hole" welds per day that will each show a tensile strength of better than 50,000 pounds per square inch.

Conclusion

Any of the three operations of arc welding can be made to fit into any gang setup for complete pipe line construction. The cost of equipment will be prohibitive

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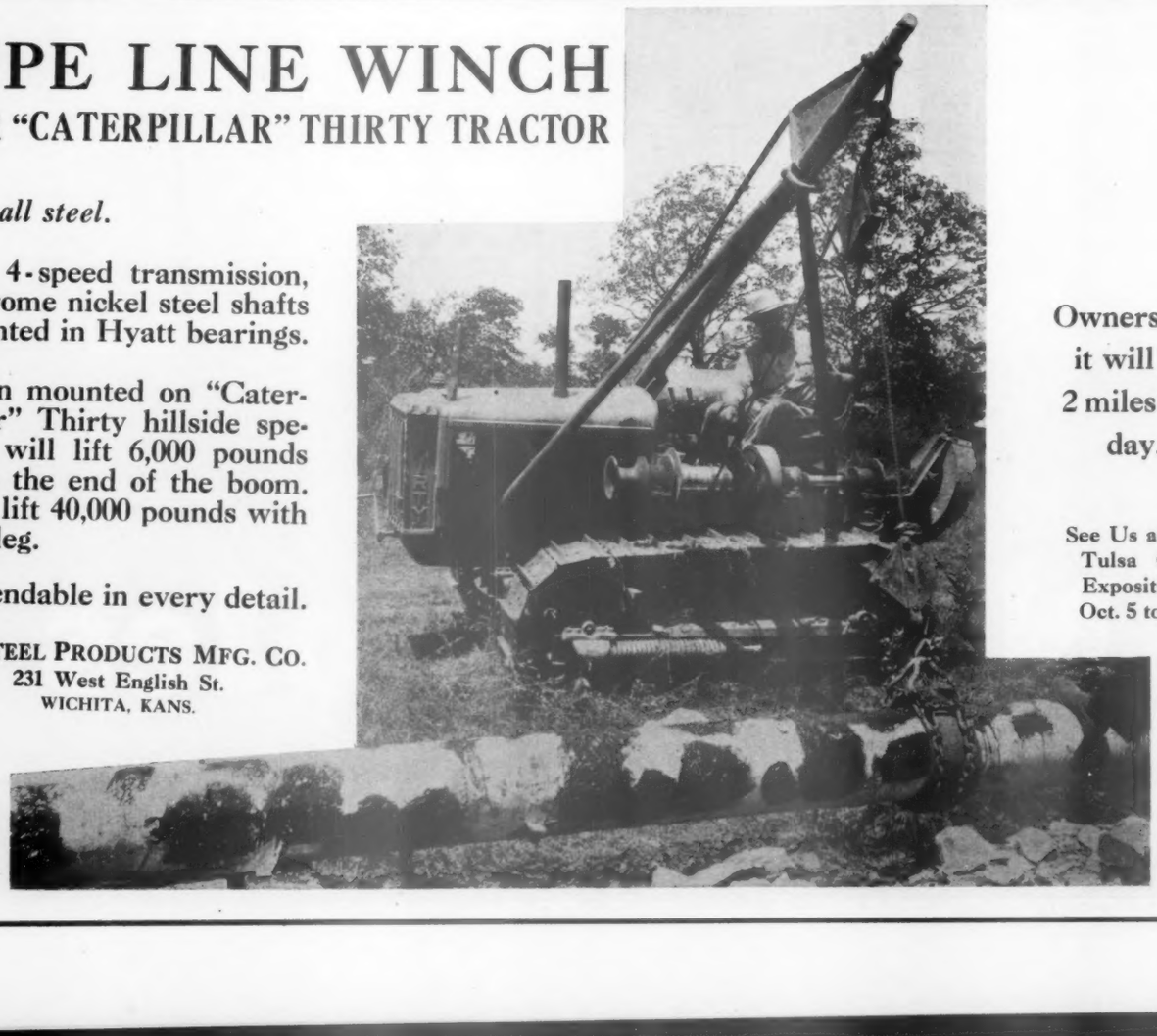

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for a single short line. The rate of progress will be equally as consistent as that of other methods of joint pipe. The most satisfactory results can be obtained if the welding operations are included in the work of a construction organization, under a single unit of responsibility and supervision, which makes a completed job from right of way preparation to completed back-fill of ditch.

In an article on electric welding of pipe lines, because of the rapid changes and improvements, it is impossible to be conclusive. An effort has been made to cover in a general way the direct current arc welding method which is now being used. Improvements have established electric welding in pipe line construction in the past two years, its future has unlimited possibilities.

FAST PROGRESS NOW BEING MADE BY TEXAS-EMPIRE PIPE LINE CO.

Fast progress now is being made in construction of the main oil line of the Texas-Empire Pipe Line Co. from Cushing, Okla., to East Chicago, Ind. Of the 690 miles of 12-inch line between these two terminals about 535 miles has been completed from Cushing to Bloomington, Ill. A few separated sections also have been finished between Bloomington and East Chicago. It is expected that the entire project will be in service before November 1.

Work has gone forward steadily the last two months by 2,500 men working in 15 to 18 gangs under four contractors. The major river crossings are in, and construction of the nine pump stations is under way. In addition to the 12-inch line the project includes an 8-inch branch of 130 miles to Lawrenceville, Ill.

When the pipe line, a joint enterprise of the Texas Pipe Line Co. and the Empire Gas & Fuel Co. was started last February 1 extremely unfavorable weather conditions prevailed. Much of the ground through which the ditch had to be dug was frozen. With the advent of warmer weather heavy rains set in, creating great areas of mud. It was June before working conditions were fairly satisfactory.

Stringing the pipe on the Texas-Empire Pipe Line Co.'s line from Oklahoma to Chicago.

River Crossings Present Problems

River crossings presented tasks calling for engineering skill and careful workmen. In crossing the Missouri and Mississippi Rivers the pipe was loaded on barges where welds were made and the pipe lowered as the barges moved by stages across the stream. At the Illinois River the pipe was welded in three sections on the bank and then pushed across. A barge carrying one end of the pipe was pushed forward by a winch on shore.

Pipe used in the Missouri and Mississippi River crossings is 25 pounds per foot heavier than that laid on land. All joints are welded and strapped with 2 by 10-inch straps about five-sixteenths of an inch thick around which river clamps weighing 1,600 pounds are placed.

The lines were laid on the river bed with a curve upstream and lowered to government specifications below the stream by pumping the sand from beneath the pipe. An auxiliary line of equal capacity is laid across each stream.

Tested at 800 Pounds Pressure

Completed portions of the line are tested at 800 pounds per square inch by hydrostatic pressure, to withstand normal operating pressure at 750 pounds. Sections 10 to 20 miles long are tested at one time, water being pumped from small streams along the route. About 750 bbls. of water per mile is required for the test.

Eight of the nine pump stations will be powered with engines of the Diesel type. The station near Scammon, Kans., will be electric equipped and connected to power lines of the Empire District Electric Co.

Robert G. Strong of the Empire's engineering division, who is superintending the field construction of the line, says high water along with the excessive rains caused trouble. All crossings have been made with rivers at high-water stage. Mr. Strong is averaging 3,000 miles of motor travel monthly.

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THIS was a 218-mile gas line in Texas. A part of the welding was done with Quasi-Arc Electrodes, as a large-scale practice experiment and test, and other electrodes were used for the rest of the line. Ten joints per man in 10 hours was the maximum for the welders using other than Quasi-Arc Electrodes, but several of the Quasi-Arc welders attained a maximum of 15 joints each per 10 hours.

□

Hydraulic pressure of 460 lbs. per sq. in. was applied to the first 4 miles of the work, this section being selected for test because of the unfavorable conditions attendant upon starting the job, and the brief experience of the welders, who had received Quasi-Arc training right on the job. All of the 16-inch pipe joints, which were Quasi-Arc welds, met this test without a leak, whereas by-pass branch pipe joints, which had been welded with other electrodes at a gate valve location with big reinforced welds, blew after 15 minutes at 460 lbs. pressure.

□

Then another 17 miles was blocked off, including 14 miles of Quasi-Arc work and about 3 miles of work done with other electrodes. Water pressure of 450 lbs. per sq. in., left on overnight, split a few inches of the other welds, but all of the Quasi-Arc welds remained tight.

□

Part of the work done with Quasi-Arc Electrodes was left uncovered for seven weeks, subject to over 70 deg. temperature variation, but not one Quasi-Arc Weld was fractured.

More Information

about this job, and other important pipe line work being done with Quasi-Arc Electrodes, will be mailed on request, together with printed matter which explains the economy, strength, resistance to corrosion, and other features of Quasi-Arc Welding.

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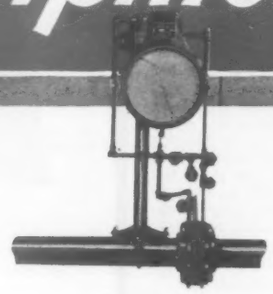
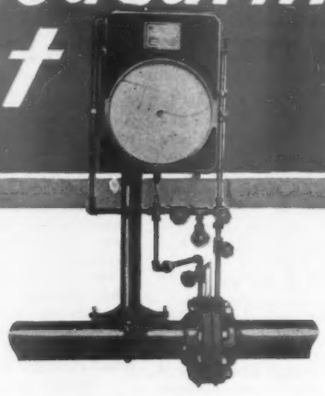


Type B Case
Flange Connections



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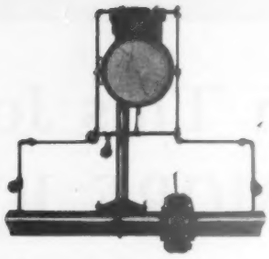
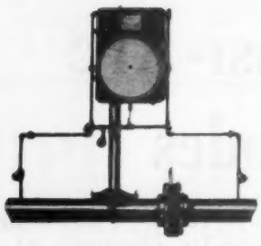
Flange Connections

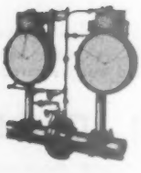


Type B Case
2½ and 8 Diameter
Connections



Type T Case
2½ and 8 Diameter
Connections

Refinery Meter
Installation



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The rewards of faithful research have been many. They have extended far. The vast betterments originating in "headquarters for gas measurement engineering" have profited, directly and indirectly, the whole structure of gas-oil commerce.

AMERICAN METER CO
MEASUREMENT ENGINEERS
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In solving the intricate problems of measuring gas and oil in any quantities, under all commercial conditions, Metric has performed a remarkable amount of resultful research. New meters to answer new conditions; better meters to overcome obstacles to accuracy; special apparatus for extending the use of measurement principles to every nook and cranny where need for measurement exists — all such achievements have been born in the research laboratories of Metric Metal Works and the affiliated companies of American Meter Company, Inc., which operate continuously and co-operatively year after year for the advancement of the art.

Listed below are some of our products which are of chief importance to gas and oil interests:

Westcott Orifice Meters	Curb Meters	American Calorimeters
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METERS

AMERICAN METER CO
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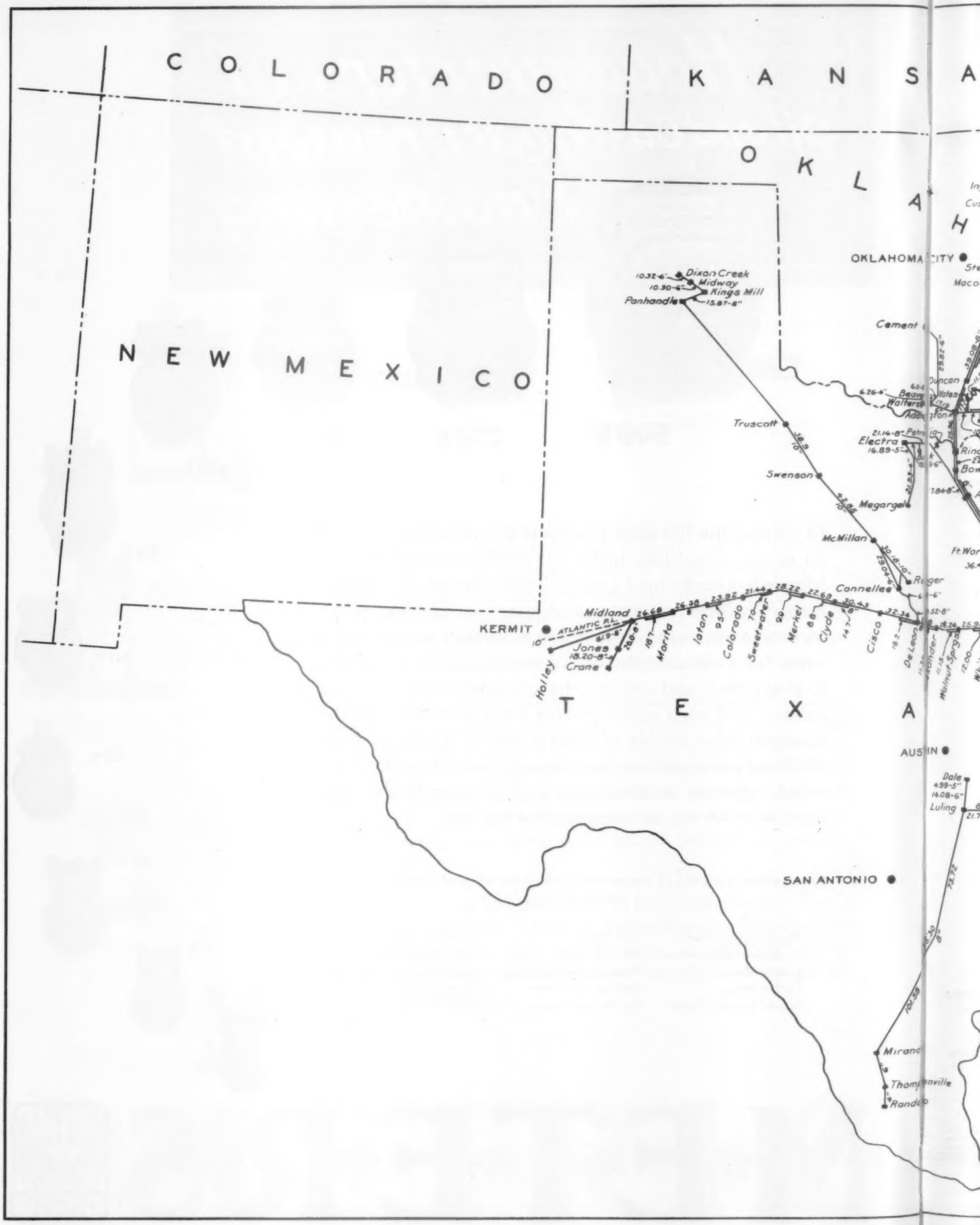
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Sweetwater
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Cisco
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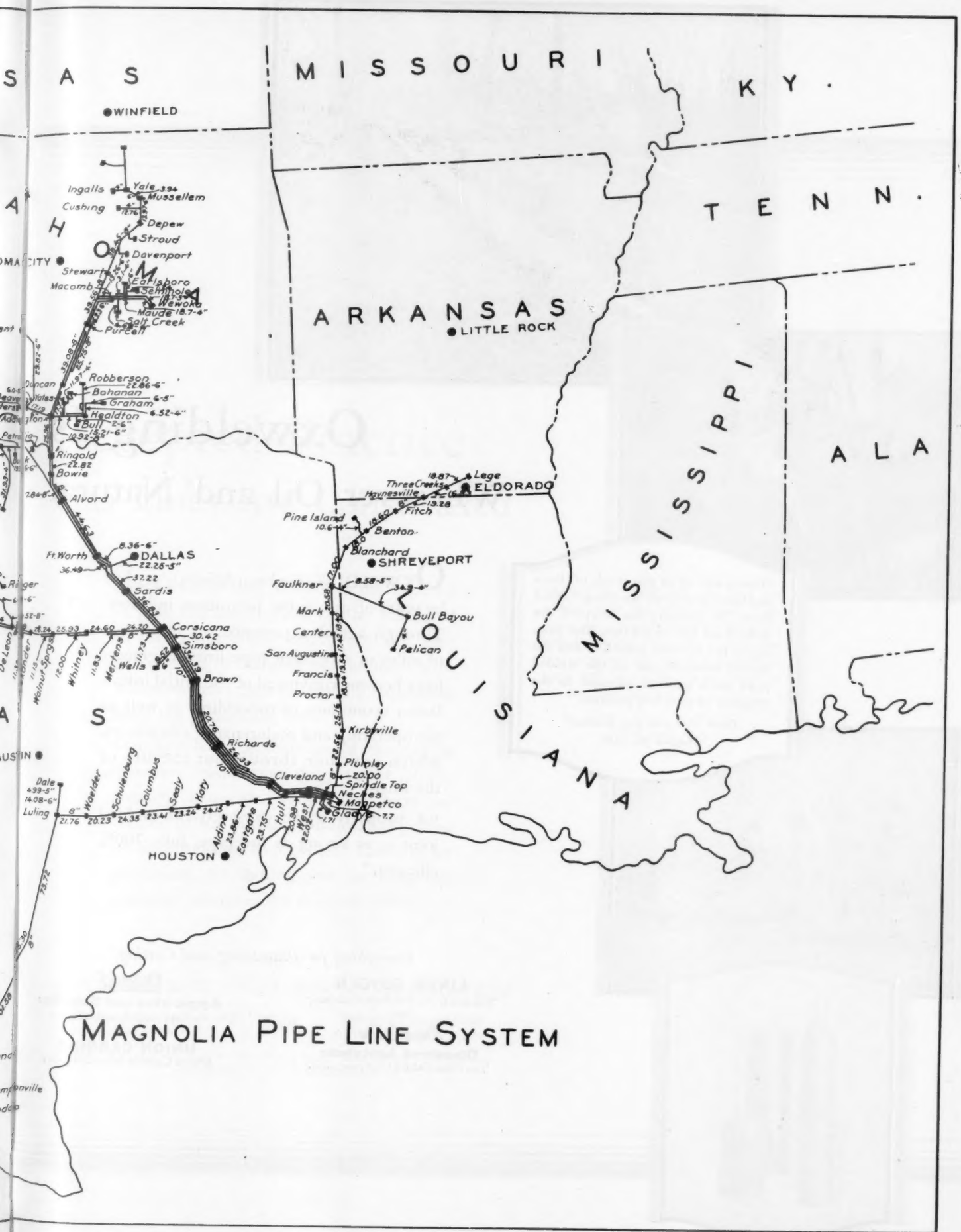
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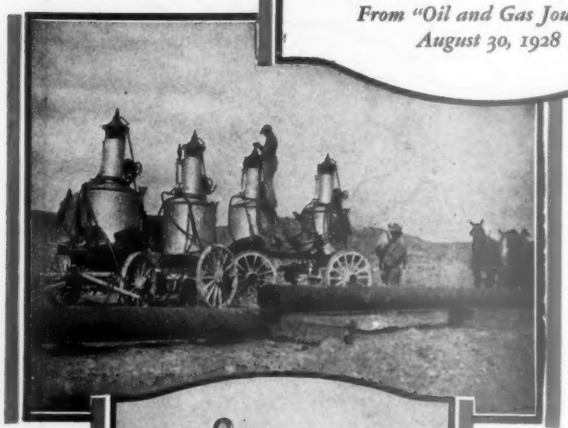
MAGNOLIA PIPE LINE SYSTEM

Oxwelding Is

Wherever Oil and Natural

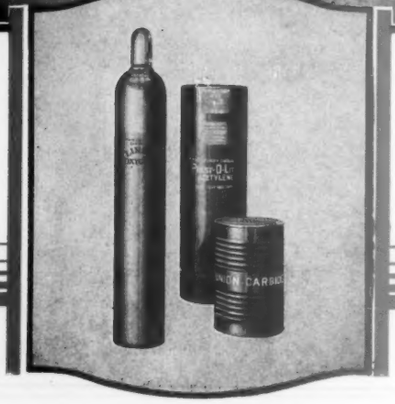
"Practically all of the trunk oil lines laid this year are oxy-acetylene welded lines. The industry has accepted the welded oil line as reliable. The passing of the screwed joint line and the almost universal use of the welded joint mark another milepost in the progress of pipe line practice."

From "Oil and Gas Journal"
August 30, 1928



OXWELDING has been definitely proven by years of use in the petroleum industry. Through actual experience on thousands of miles of oxwelded pipe lines, engineers have become convinced of the initial installation economies of oxwelding as well as the operating and maintenance efficiencies, which continue throughout the life of the line.

"A properly made oxy-acetylene welded joint is as strong as the pipe, fully 100% efficient."



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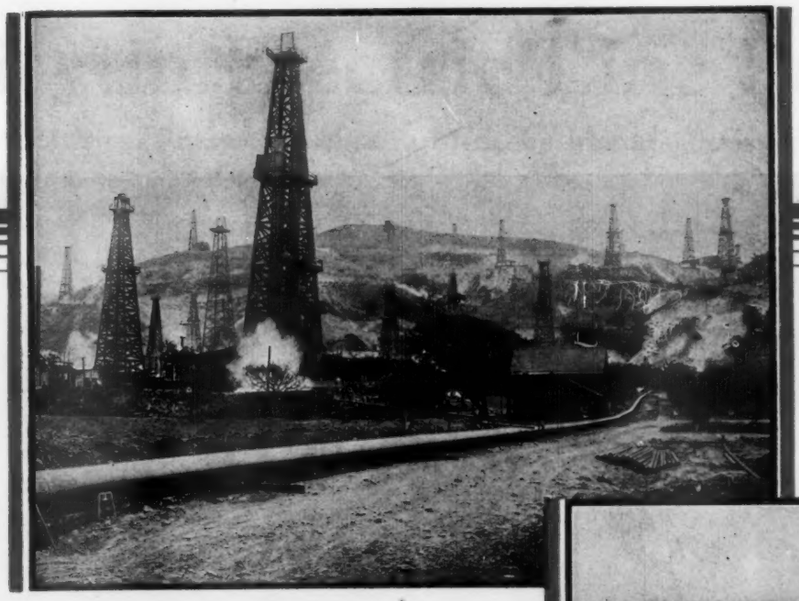

Accepted Practice

Gas Lines Are Constructed

THE success that oxwelding has attained in pipe line construction can be attributed to the characteristic confidence and progressiveness of the pipe line builders with whom we have been in intimate association since the pioneering days.

Our first hand knowledge of the urgent demands made upon the supplier of oxwelding materials, as projects have increased in size and importance, has guided us in providing unparalleled facilities for producing, distributing and servicing our products wherever the demand exists.

"About ten years ago the first oxwelded pipe line was installed. Pipe line engineers were quick to recognize its advantages. Since then there has been a steady increase in installations until now oxwelding is accepted as the standard practice."

From "Pipe Line News"
May 29th, 1929

Units of

UNION CARBIDE AND CARBON CORPORATION

General Offices: 30 E. 42nd St.
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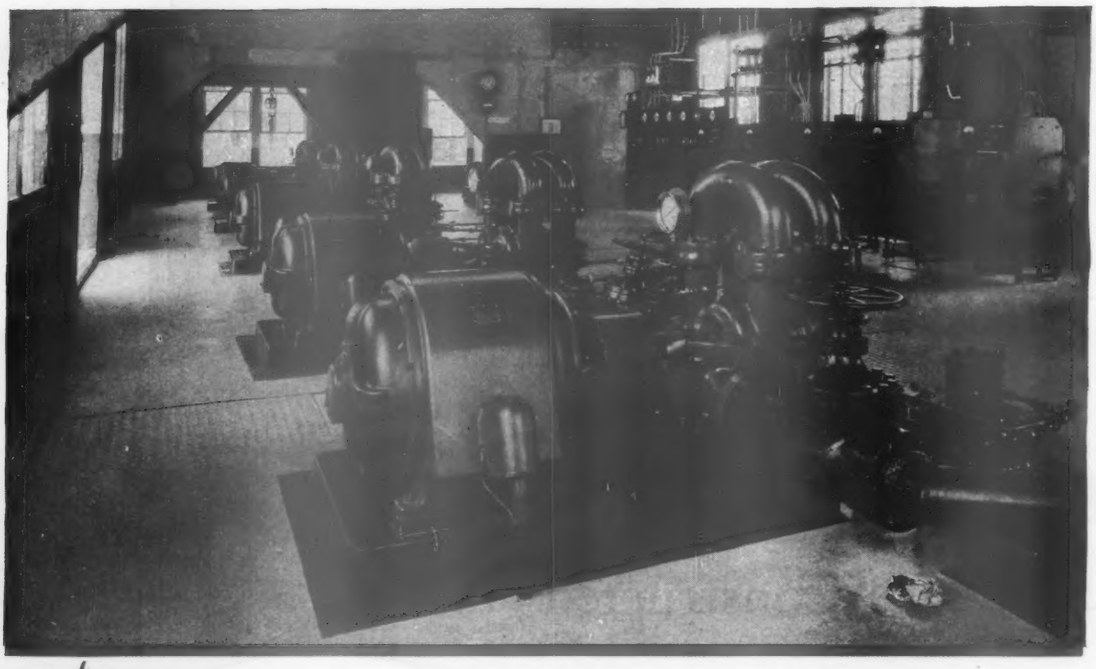
Offices in Principal Cities
Throughout the Country

64 Oxygen Plants—45 Acetylene Plants—154 Oxygen Warehouses—138 Apparatus Warehouses—235 Carbide Warehouses



Magnolia Pipe Line Co., Sardis Station—1500 H. P.

THE MODERN TREND IN THE PETROLEUM INDUSTRY IS TO PURCHASED ELECTRIC POWER

ELECTRIC POWER for Pipe Line Pumping

Purchased Electric Power is daily proving its superiority to any other form of power for pipe line pumping.

TEXAS POWER & LIGHT CO.

General Offices, Interurban Building, Dallas, Texas

Providing for the Texas of Today—
Planning for the Texas of Tomorrow

Flexibility in Electric Line Pumping

More Efficient Pumps and Motors Made by Manufacturers Big Factor in Greater Consideration Given This Type of Power

By Oscar Wolf
Assistant Chief Engineer, The Texas Pipe Line Co.

During recent years the gradual reduction of electrical power rates has brought electrification of pipe line pumping within a range of application where, under certain conditions, it may be shown to be preferable on economic grounds to other forms of prime movers hitherto considered the most efficient from a financial point of view. However, a mere reduction in power rates could not have accomplished this ever widening application of electrical energy to crude oil transportation, had it not been for the efforts on the part of manufacturers to develop pumps and motors to a point of mechanical efficiency where they may show a better over-all financial efficiency than Diesel reciprocating pump installations, especially when intended for use during a comparatively short period of years.

Numerous economic comparisons between Diesel reciprocating pump and motor driven centrifugal pump installations have appeared in the technical press from time to time,[1] based in many instances, it is true, on artificial set-ups as to comparative investment and operating costs. Just recently a new pipe line system has been put into operation, containing in series nine motor driven centrifugal and three Diesel reciprocating pump stations, all of them carrying practically the same load under almost identical conditions. A direct comparison of operating costs and fixed charges between the two types of stations should be of greatest interest, once the system has been in operation long enough to accumulate the necessary data. Without going into further details at this time, it can be stated that with a modern centrifugal installation of good design, an energy consumption of 250 K.W.H. per 1,000 bbls. pumped at 600 pounds pressure, may be attained. This represents an over-all efficiency of motor and pump of 73 per cent, and for the pump alone of

$$\frac{0.73}{.94} = 77.8 \text{ per cent.}$$

[1]See J. B. Thomas, Transactions A.S.M.E., Vol. 51, No. 14; W. R. Layne, Transactions A.S.M.E., Vol. 51, No. 14.

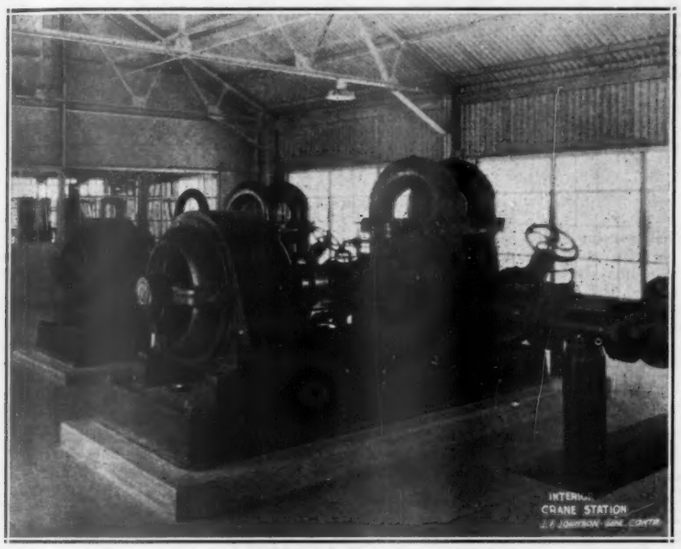


Figure 1—West Texas centrifugal pump installation 2—6"—4 stage pumps in series; 1,750 R.P.M. Driven by 400-horsepower induction motors.

Figure 2—West Texas centrifugal station.

Motors for Pipe Line Pumping

For pipe line pumping, the motors in most general use are either of the squirrel cage induction type, or else the synchronous motor. The first is often preferred on account of the fact that absence of slip-rings permits its use without an intervening partition or fire wall. The synchronous motor, on the other hand, due to its slightly higher efficiency, and its inherent quality of power factor correction, is often used, especially when the power contract calls for a demand charge based on a maximum demand charge expressed in K.V.A.

Both type of motor are, however, one-speed machines, and do not provide the operating flexibility which it is possible to attain with the modern Diesel drive or steam pumps. This lack of flexibility has been severely felt in connection with motor driven reciprocating pumps, and to some degree proved a deterrent to their use. Attempts to overcome this have been made by means of changing plungers, or else by the energy wasting evil of by-passing. There is, however, a means of varying the rate of pumping of a motor driven reciprocating pump installation with an energy consumption approximately in proportion to the load. Details of this method, which up to the present has not been used in pipe line service, will be described below.

In this connection the centrifugal pump has inherent qualities of regulation on account of its peculiar head-capacity characteristic, which makes it much more suitable for motor drive than the reciprocating pump. (See Figure No. 4.)

The head-capacity characteristic of any pipe line system may be expressed in graphical form as shown in Figure 4. in which A, B, C and D represent the characteristic curves based on viscosity and gravity of the oil corresponding to

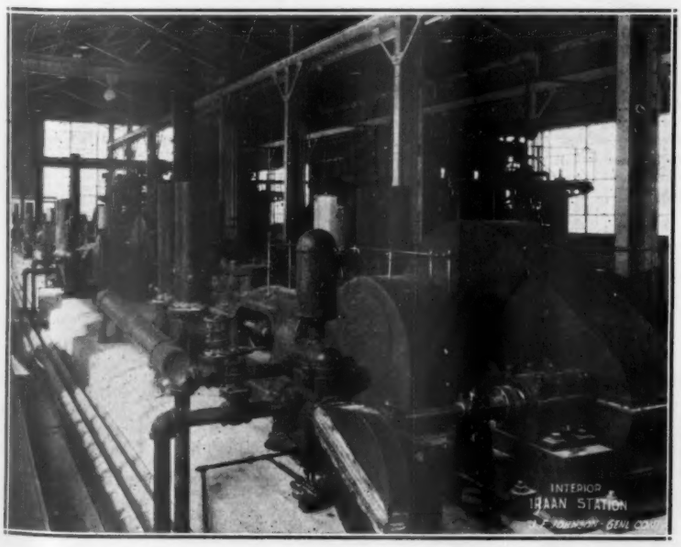


Figure 3—West Texas Diesel station of equal capacity as Figure 1.

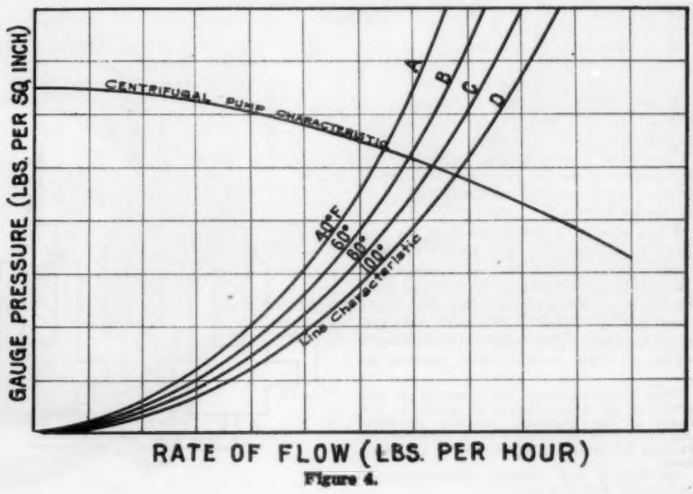


Figure 4.

the temperatures indicated. In other words, the curves are the loci of the equation.[3]

$$P = \frac{fsLQ^2}{d^5} + 0.433S(z_2 - z_1), \text{ in which}$$

$$f = \phi\left(\frac{Q}{dn}\right).$$

S = Specific gravity of the oil.
L = Length of line in miles.

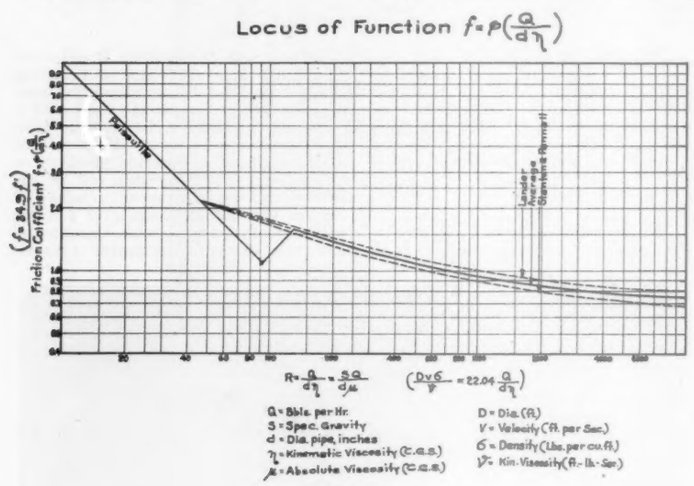

Locus of Function $f=\phi\left(\frac{Q}{d\eta}\right)$
Friction Coefficient $\left(f=\frac{2.42\,F'}{R^{1.85}}\right)$
Reynolds No.
Lander Average Standard Formula
$R=\frac{Q}{d\eta}=\frac{50\,Q}{d\mu}$
$\left(\frac{DV\delta}{\mu}=22.04\,\frac{Q}{d\eta}\right)$
Q = Bbls. per Hr.
S = Spec. Gravity
d = Dia. pipe, inches
η = Kinematic Viscosity (C.G.S.)
μ = Absolute Viscosity (C.G.S.)
D = Dia. (ft.)
V = Velocity (ft. per Sec.)
δ = Density (lbs. per cu. ft.)
ν = Kin. Viscosity (ft.-lb.-Sec.)

Figure 5.

Q = Rate of flow in barrels per hour.
d = Pipe diameter in inches.
z_1 = Elevation of initial station above datum.
z_2 = Elevation of terminal station (or control point) above datum.
P = Pressure drop in pounds per square inch.

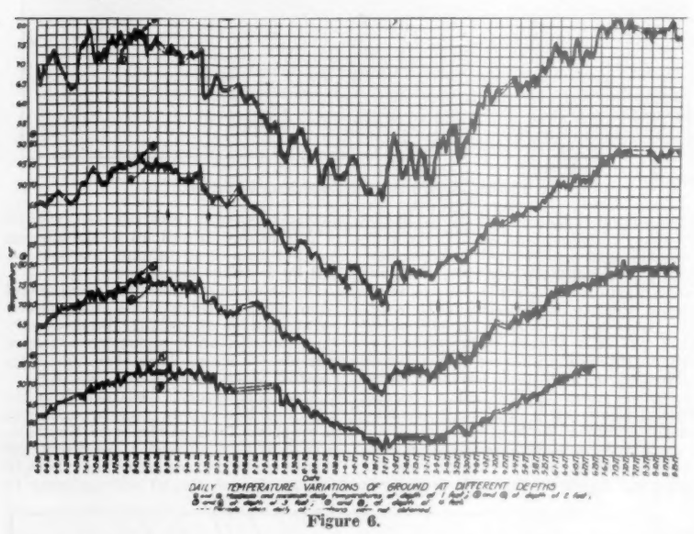


Figure 6.

n = Kinematic viscosity (C.G.S. units).
ϕ "is the function of."

During 1926 and 1927 the Bureau of Mines, at their Bartlesville station, observed the ground temperature variation at depths of 1, 2, 3 and 4 feet below the surface for a period of about one year.[3] These temperature fluctuations are shown in Figure 6.

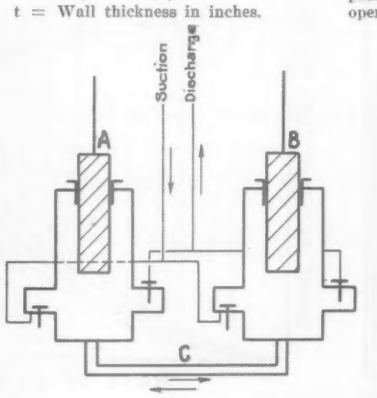
If we assume a 2-foot covering for the pipe, it is seen that a seasonal temperature fluctuation of the oil between the limits of approximately 40 degrees and 80 degrees Fahrenheit may be experienced. The viscosity of most crude oils is very sensitive to temperature changes which, in turn, have a direct bearing on the pressure drop for a given rate of flow. This is expressed in the friction coefficient change $f = \phi\left(\frac{Q}{dn}\right)$. See Figure No. 5.)

For a pipe line system handling normally viscous oils, 100 secs. @ 40 degrees Fahrenheit and 56 secs. S.U. at 80 degrees Fahrenheit, the resulting change in capacity may be shown to be in the neighborhood of 10 per cent of the average rate of flow.

If in Figure 7 "P" represents the permissible maximum working pressure on the line as determined by

$$p = \frac{2St}{d}$$

S = Safe fibre stress (pounds per square inch).
t = Wall thickness in inches.



[3]This equation does not conform to the principle of homogeneity so dear to the heart of the physicist, but for practical purposes it is of advantage to express the various terms in units, current in the business.

[3]Rawlinson and Johnson, Department of Commerce, Serial 2,857.

d = Outside pipe diameter in inches.

the Diesel driven reciprocating pump can take full advantage of the increased summer capacity simply by variation of the engine speed. Engines of modern design in use in pipe line service are usually equipped with a long range speed governing device permitting a variation of the operating speed between 65 and 110 per cent of the normal number of revolutions.

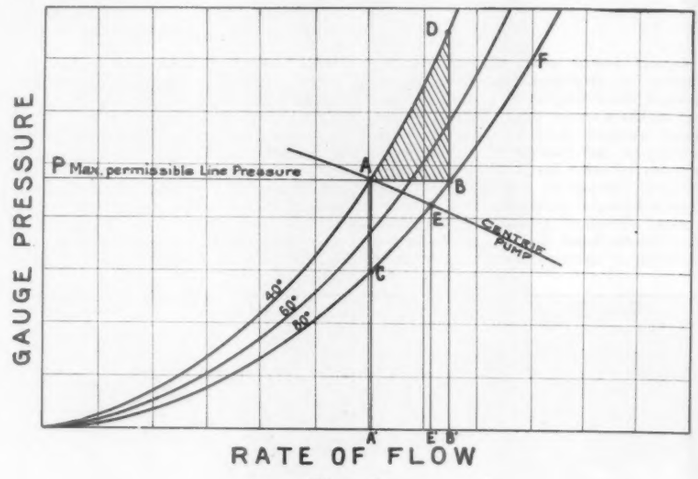


Figure 7.

When serving fields of flush production it is often found imperative to operate a pipe line system at its maximum capacity, and the Diesel driven unit has the operating flexibility to give this "constant pressure" regulation.

Centrifugal Pump

The centrifugal pump, on the other hand, has inherent qualities of regulation in that it will adapt itself automatically to the rate of discharge indicated by its "Head-Capacity" curve for the particular pressure under which it is called upon to operate. In the case of Figure 7, a centrifugal pump of the characteristic shown would, in the winter time, deliver into the line the amount corresponding to A'. In the summer time when the reduced viscosity of the oil changes the line characteristic to O-F', the pump would automatically find its operating point at the intersection of the pump and line characteristics, in this case E, and deliver into the line the amount corresponding to E'. It is to be noted that this adaptation of the pump to the particular line conditions takes place without change of speed of the prime-mover.

Taking next the motor driven reciprocating pump, and assuming that the operating speed and plunger sizes are so chosen as to produce maximum permissible line pressure under winter conditions of operation, it is found that with the fixed speed imposed by either induction or synchronous motor drives, the pressure will drop to point C under summer conditions. This "constant volume"

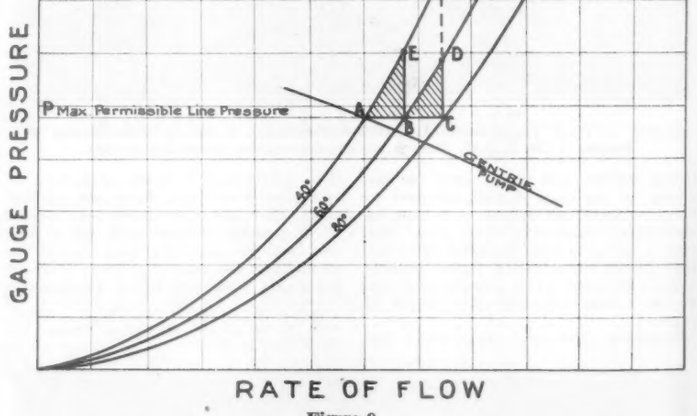


Figure 8.

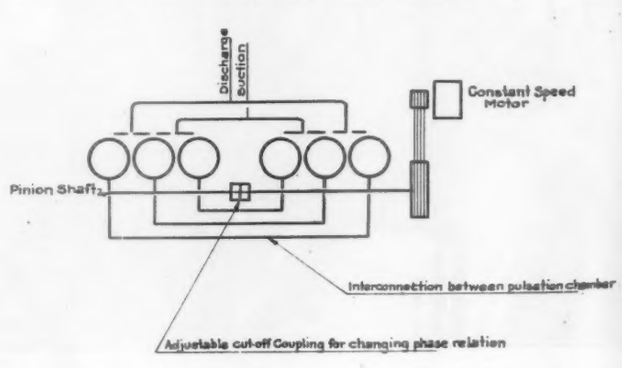


Figure 9—Diagram of "Variphase" pump.

AMERICAN INDUSTRY *needs more* NATURAL GAS

"... the Future of American

THE expansion of the natural gas industry has been one of the outstanding industrial accomplishments of the past quarter-century. Because of it, scores of communities—hundreds of industrial plants—thousands of domestic consumers—are enjoying the benefits and economies of a cheaper and better fuel.

Yet, from this height of achievement, the natural gas industry looks out upon even wider horizons, with even greater opportunities for expansion and usefulness. For, where fuel is cheap and abundant, all industries expand and new industries appear—and population follows industry.

America's vast systems of gas pipe lines have been built to put this ideal fuel where it has been needed. And the future will bring still greater systems, that new markets may be reached and opened up, and new industries and communities benefited.

From the very beginning, it has been the privilege of the Hope Engineering Company to contribute—with experience, engineering, man-power and equipment—to the unprecedented progress of the natural gas industry. For twenty-three years, the Hope name has been identified with most of the outstanding natural gas developments. And today the Company is qualified and equipped to serve the industry even better than before, in the still greater developments which lie ahead. The all-comprehensive scope of Hope Service is briefly outlined as follows:—

Industry lies in the Development of our Natural Wealth!"

Field and Market Research

HOPE specialists investigate and report upon new or undeveloped gas fields, including quality and quantity of gas, cost of production, and probable output; analyze existing markets, near and far, and forecast the probable expansion or development of new markets; furnish preliminary reports upon the cost and commercial possibilities of development and operation.

Engineering Counsel and Design

HOPE engineers are ready with experienced counsel prior to actual development of a property, covering field surveys for pipe line construction, location and design of main line and booster stations, gathering plants, and city and intercity distribution systems.

Organization and Finance

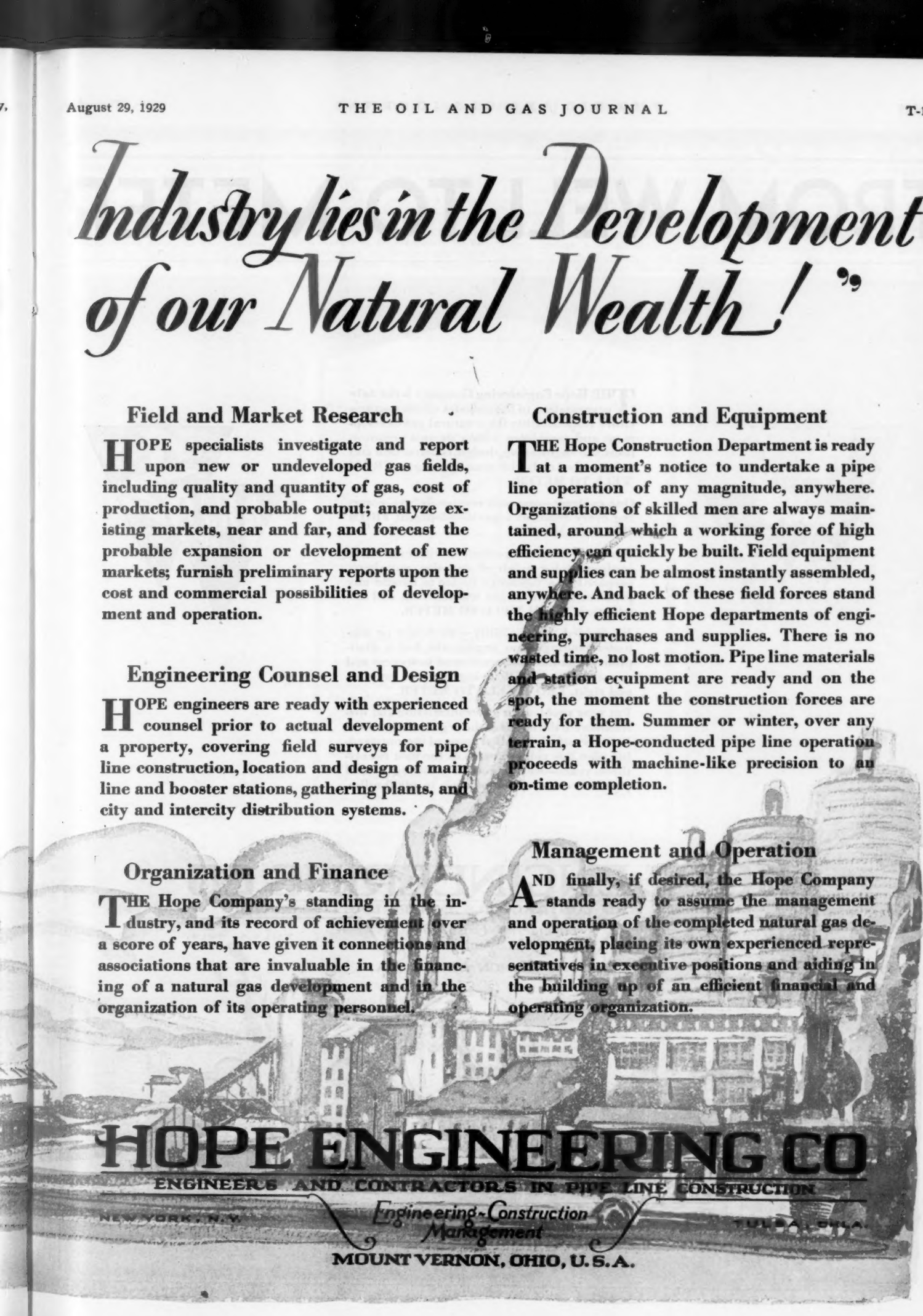
THE Hope Company's standing in the industry, and its record of achievement over a score of years, have given it connections and associations that are invaluable in the financing of a natural gas development and in the organization of its operating personnel.

Construction and Equipment

THE Hope Construction Department is ready at a moment's notice to undertake a pipe line operation of any magnitude, anywhere. Organizations of skilled men are always maintained, around which a working force of high efficiency can quickly be built. Field equipment and supplies can be almost instantly assembled, anywhere. And back of these field forces stand the highly efficient Hope departments of engineering, purchases and supplies. There is no wasted time, no lost motion. Pipe line materials and station equipment are ready and on the spot, the moment the construction forces are ready for them. Summer or winter, over any terrain, a Hope-conducted pipe line operation proceeds with machine-like precision to an on-time completion.

Management and Operation

AND finally, if desired, the Hope Company stands ready to assume the management and operation of the completed natural gas development, placing its own experienced representatives in executive positions and aiding in the building up of an efficient financial and operating organization.



HOPE ENGINEERING CO

ENGINEERS AND CONTRACTORS IN PIPE LINE CONSTRUCTION

NEW YORK, N. Y. *Engineering-Construction Management* TULSA, OKLA.

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FROM WELL TO METER

THE Hope Engineering Company is the only organization in the industry which assumes entire responsibility for a natural gas development and completes, within its own organizations, the engineering, design, construction and (where desired) the management—FROM WELL TO METER.

One contract—one unit responsibility—covering every detail of a gas development FROM WELL TO METER.

One all-inclusive organization with ever-ready equipment for a job of any size, anywhere, prepared at a moment's notice to handle any problem in natural gas transmission and distribution, FROM WELL TO METER.

No divided responsibility—no delays or misunderstandings—no arguments; but a disciplined organization accustomed to success and concerned only with doing the job, on time and right, FROM WELL TO METER.

Put your problem in gas transmission and distribution in the hands of the organization which has successfully handled many of the outstanding pipe line achievements in the past twenty-three years—with a record covering a total pipe line construction of close to 6000 miles.

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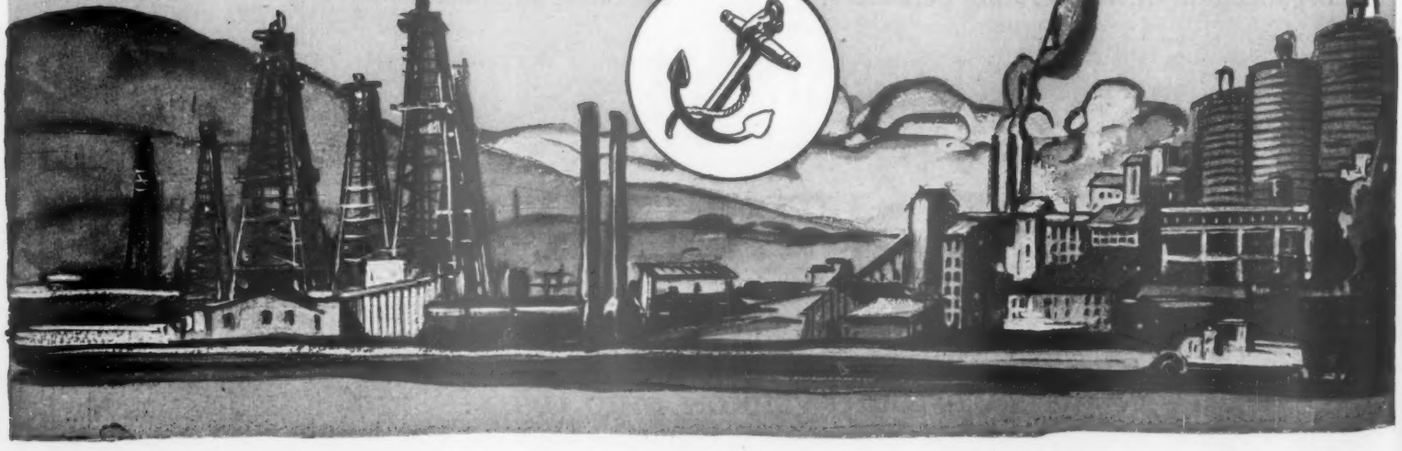


regulation results in loss of line capacity represented by A' — B'.

Supposing now that speed of pump and plunger sizes be arranged in a manner which will produce maximum permissible line pressure under summer conditions, i.e., at point B in diagram of Figure 7. It is at once evident that with a lowering of the oil temperature, or change in viscosity due to handling of a more viscous crude, the line pressure would have the tendency of increasing along the ordinate B — D, and thus exceed the safe working pressure. In fact, this very condition has often occurred in motor driven stations, and is usually counteracted by the method of "by-passing" part of the pump discharge. Nearly

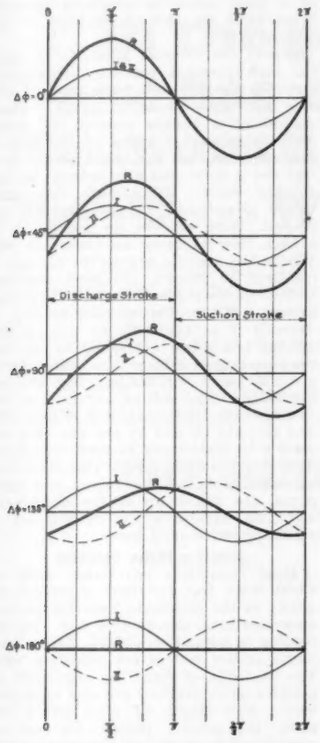


Figure 10—Resultant discharge of two-chamber "Variphase" pump.

all such pump installations, where this condition is likely to occur, are equipped with a small by-pass line and needle valve between the suction and discharge of the pump. "Slight "cracking" of the valve permits the escape of part of the pump discharge into its suction instead of being forced into the line. In this manner the line pressure can be kept within the proper limits, although always at the expense of wasted energy.

Again referring to Figure 7, under winter conditions, temperature of oil 40 degrees Fahrenheit, a pump operating at a rate of flow corresponding to B', the waste of energy is proportional to the shaded portion of the diagram.

It has, at times, been attempted to circumvent this useless power expenditure by providing the pump with two sets of plungers, one set for summer, and one for winter operation. If the plungers are changed during spring and fall when oil temperature is approximately 60 degrees Fahrenheit, the power waste would be reduced, but not avoided altogether. (See Figure 8.)

The total amount of power lost per year can be estimated in this manner if the average daily temperature conditions for the oil in the ground are available from data similar to those shown in Figure 6.

For small pumps this loss may not be so serious, but when motor driven reciprocating pumps of large capacities are used in main line stations, this loss of power and of over-all financial efficiency may become a matter of serious concern.

In one instance the writer noted an installation where reciprocating pumps were driven by variable speed slip ring induction motors. However, as this is simply "by-passing" in the form of electrical energy instead of frictional resistance, this arrangement does not solve the problem of keeping the power consumption approximately proportional to the load.

An attack from an entirely different angle is therefore necessary, and the solution seems to lie in the application of a principle patented by George C. Hicks, Jr., of St. Louis, Mo.[4] This patent utilizes the principle of obtaining variable pump discharge through change in phase relation between two plungers acting on two separate pumps driven by a common pinion shaft. Both pumps have their suction and discharge lines manifolded into one suction and one discharge outlet, and both plunger chambers are interconnected by means of an equalizing pipe connection. Figure No. 9 shows this arrangement in diagrammatic form.

The common pinion shaft actuates both pumps through a cut-off coupling, such as the "Fast" for instance, which makes it possible to change the phase relation of plungers A and B. The pumps must, of course, be stopped for this adjustment,

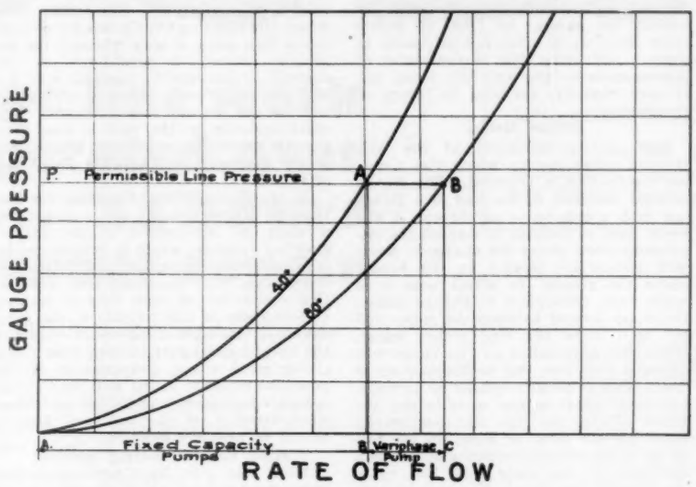


Figure 11.

and one pump barred over to the desired point. Graduations calibrated in barrels per hour, and shown directly on the cut-off coupling, facilitate the proper setting of the pumps for any desired capacity.

Change of the phase angle makes it possible to vary the discharge of the entire unit from zero to its rated maximum capacity. Maximum output of the pump will, of course, be obtained when plungers A and B are in phase, i.e., when they are traveling in and out of their respective plunger chambers in unison. If the phase angle between A and B is changed to 180 degrees, i.e., plunger "A" traveling outward while "B" is moving into the chamber, the resultant discharge is zero. These are the extreme points of operation and rates of discharge lying between these limits can be obtained by simply setting the cut-off coupling on the pinion shaft at its proper operating point. In Figure 10 the effect of the phase angle variation for two plungers is shown for angular displacements of 0 degrees, 45 degrees, 90 degrees, 135 degrees and 180 degrees. These diagrams are in reality velocity diagrams, but since Q = av, the areas enclosed between the abscissa and the resultant curve are proportional to the discharge of the pump.

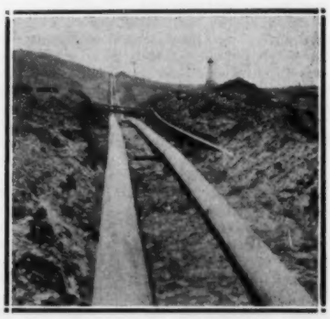
In actual practice this type of installation would probably take the form of two vertical triplex pumps operated in parallel, in the manner described above.

In order to show the application of such a "variphase" pump, let it be assumed that the line capacity for a proposed reciprocating station fluctuates between 46,000 bbls. per day in the summer time and 42,000 bbls. during winter conditions. The variable speed pump would in this case be installed in parallel with two of the regular line pumps of a fixed capacity of 21,000 bbls. each, the fixed speed pumps discharging the amount A — B, and the variable discharge pump the amount B — C, which is variable and depends upon the viscosity of the oil. It is to be noted especially that the variphase pump may be driven by a fixed speed motor of the regular squirrel cage induction type, and that the power consumption for this additional capacity is directly proportional to the increase in line capacity, if slight variations in motor efficiency due to partial load are disregarded. In other words, capacity variation may be attained by the use of highly efficient induction or synchronous motors without the necessity of speed variation.

The application of this "vari-phrase" principle, which has just been described, provides an efficient and economical means of overcoming the lack of flexibility inherent in motor-driven reciprocating pumps. With this principle in use, and under favorable power-rate conditions, there should result an ever-widening use of motor-driven reciprocating installation in pipe line service.

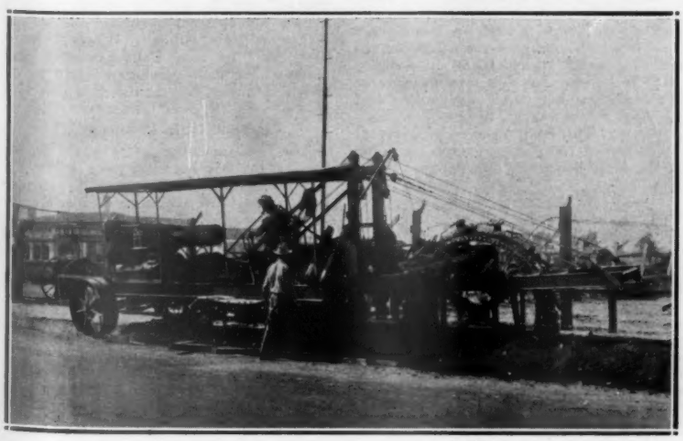
[4]This patent has been assigned to the Worthington Pump & Machinery Corp.

CALIFORNIA PIPE LINE

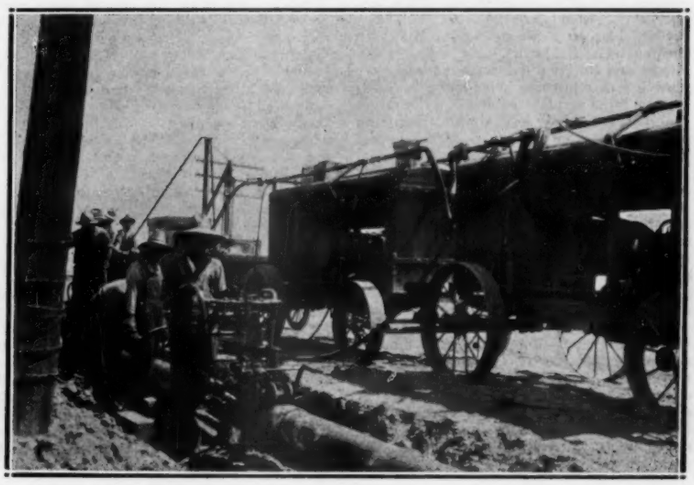


A 16-inch and a 12-inch natural gas line recently laid by the Standard Oil Co. of California in the Kettleman Hills Field.

DITCHER PREPARING WAY FOR PIPE LINE



PIPE CLEANING MACHINE IN OPERATION



How Pipe Line Companies Measure Gas

Recognized as a Scientific Problem, the Cash Register for the Whole Company. Better Methods Used

By D. A. Sillers
Superintendent, Gas Measurement, Lone Star Gas Co.

In the beginning of the natural gas industry it was general practice to pay $100 a year rental for a gas well and then sell the gas on a flat rate which was determined by counting the number of outlets in a residence, or by estimating the load used by an industrial consumer. This method of handling gas resulted in a great deal of waste and was very inequal to all parties concerned. The first step in the direction of measuring gas was to adopt the tin meter used in manufactured gas to natural gas requirements, by installing the usual diaphragm and slide valve movement in an iron case. This was satisfactory for domestic consumers and very small industrials. The large wet drum meter used as a station meter in manufactured plants was too expensive for measuring industrial gas. The next development resulted in the use of proportional meters in which an automatic valve passes 2 per cent of the gas through a small domestic type meter and the index was geared up to show the total amount of gas passed. The proportional meter was very widely used, and a large number are still used where the volume handled does not warrant the investment in later types of meters. The automatic valves in a proportional meter may get out of adjustment so as to pass more or less than the desired proportion of gas through the tally meter, and thus very large inaccuracies are possible. Proportional meters are usually tested with a funnel meter which is in itself very erratic, and in general the proportional meter is not considered an up-to-date method of measurment.

Most of the large volumes of gas now measured by pipe line companies are measured through orifice meters. The outstanding engineer in the development of the orifice meter is Thomas R. Weymouth, now president of the Oklahoma Natural Gas Corp. Mr. Weymouth developed the efficiency, or E-curve, upon which all orifice meter coefficients are based. The accuracy of this orgnal work was such that after four years intensive study and experiments by a large committee of the American Gas Association, the committee has not yet recommended a revision of this curve, and the measurement of gas by orifice meters can be used with confidence as to its accuracy within any usual commercial limits. One distinct advantage of the orifice meter lies in the fact that the installation expense for measuring very large volumes is but very little more than that for small volumes, and the working capacity of the meter can be very readily and inexpensively changed to meet varying conditions.

Starts at the Well

The measurement of gas by pipeline companies starts at the well. Most gas is now purchased on a measurement basis rather than on a yearly rental basis. In the eastern fields a large number of large size positive displacement meters are used for this purpose where gas is taken from a large number of small wells. Here the installation is very simple, requiring only the gate on the outlet of the meter. The well can be shut during testing so no bypass is necessary, and the testing apparatus attached to the outlet of the meter with the line gate closed and the meter outlet disconnected. Flowometers or funnel meters have been used for testing purposes. Recently the critical flow prover method has been developed and is generally considered much more accurate and dependable than the former methods.

The first high pressure positive meters were equipped with pressure and volume recorders, the chart being rotated by the movement of the meter. This gave a chart which is very simple to calculate, a weighted pressure being recorded on the chart. It has the disadvantage of not showing when a meter goes dead. The pressure volume and time charts are now in general use. In using these charts it is necessary to read the average pressure for each individual loop on the chart recording the passage of 1,000 or 10,000 cubic feet. It is often felt advisable to place a restricting disc in the outlet of these meters to prevent their being run at over capacity, resulting in injury to the meter.

Orifice Meters

Most gas is measured at the well through orifice meters, where also a simple installation is required. The flange is often installed in the line in a flange box with a gate valve on the end of the outlet joint of the pipe to shut off the line pressure when plates are changed. Many well meters are located on the bypass above the ground, in which case it is much more convenient to change plates. Drips are located between the meter and the well when the well makes water. Often the differential on the meter will record a wide line, due to fluctuations in flow. This is usually caused by accumulations of water in low spots in the line which fill up the line and temporarily shuot off the flow, or move up the line by the accumulated pressure and then run back into the low spots in the line, again shutting off the flow. The only way to eliminate this condition is to install drips a few feet past the low spot in the line. Many meters are left standing in the open or in a small box which covers the meter only. It is very advisable to build a house at least six feet square so that the meter and the repair man will be protected from the weather. Seven-day charts are coming into more general use to save the expense of chart changing in the field. One company has developed a clock which will be switched on to a seven-day timing when a well is shut in, and back to 24-hour timing when the well is being used. The hourly reading method of computing charts is most generally used, superseding the use of the planimeter, because of its greater efficiency. A machine has recently been put on the market in which pens are made to follow simultaneously the static and differential, and which makes instantaneous calculations and gives the total extension from the whole chart directly. This machine has great possibilities.

Open Flow

Where large high pressure wells have been found to be hard to control so as to get proper measurement, various adaptations of the choke nipple principle have been used to eliminate freezing at the master gate and at the orifice plate. Heaters are used to some extent, but the choke nipple properly worked out is much safer and less expensive. The open flow measurement of wells has assumed considerable importance in recent years, due to the necessity of conforming to state regulations and the equable proration of delivery. The Bureau of Mines has published a table from which open flow of wells of large diameter can be properly computed from the open flow test taken through an opening of smaller diameter. This greatly reduces the hazard in making these tests, and also reduces the investment in large fittings.

Walter Reid, consulting engineer, has developed a new formula for properly computing the open flow of large wells where the gas reached critical velocity. Due to the large wastage of gas in making open flow tests, and the possible injury to the well, the American Gas Association has appointed a committee, headed by N. C. McGowen, of the Palmer corporation, to study the possibilities of obtaining the open flow, or the capacity to deliver, of wells, without opening the well to make the test. One plan being considered is known as the Parsons Plan, whereby an original open flow and shut-in rock pressure test is made and current open flow calculated as being proportional to the current shut-in rock pressure, according to a curve which was developed by experiment. The Indian Territory Illuminating Oil Co. has for several years been using a plan whereby the allowable delivery is considered as the amount of gas which the well will deliver, using a back pressure of 90 per cent of the shut-in rock pressure. The chief objection to the plan is that they are not generally considered to be generally adaptable to all fields and types of sands.

At the Kansas City convention the Bureau of Mines brought out a paper describing the application of the Pierce-Rawlins formula, which is believed to be a basic formula applying to all fields and conditions. The American Gas Association committee on open flow is making a close study of this formula at the present time. Its application would eliminate the hazard and waste of open flow tests, giving much closer measurement of the potential capacity of the well, and giving valuable information as to the individual characteristics of the well and how it should be properly handled.

Main Line Measuring Stations

Most long pipe lines have main line measuring stations which are used to indicate leakage along the line and furnish dispatchers with information as to the amount of gas being handled. Where the flange is directly in the main pipeline, it is very desirable that there be gates located on both sides of a flange so that it will not be necessary to drain several miles of line in order to change a plate. The best practice is building a main line measuring station consisting of putting a header across the line, coming out of the ground through two risers of smaller diameters with gates on the risers, passing through two orifice meter runs and passing into the line in the same manner. This station uses four small gates instead of two large main line gates. The expense of large gate boxes and a flange box is eliminated. The main line gates are on risers and less subject to dirt problems, and the proper size orifice can always be put in one line while gas is passing through the other. The total expense of this type of station will be found to be very little more than that of installing the flange in the main line, and its many advantages are obvious.

Most pipeline companies have a number of small sales off the main line. The regulators and measuring stations should always be located at the main line. This eliminates loss to the pipeline company due to leakage in the line to the consumer and the stealing of gas off this line. It also puts the company's equipment at the main line, where it can be regularly inspected by the line walker. It is usual practice to install a small high pressure regulator and a house service regulator measuring the gas at 8 ounces through the meter. There is now on the market a meter which measures gas at 20 pounds with an index which reads in 4-ounce gas. The consumer then receives gas at 20 pounds into the small service line and regulates to ounces at the point of consumption. This arrangement has several advantages if the high pressure regulator can be kept at 20 pounds delivery pressure.

At City Gates

The most important measuring stations are those located at city gates and those delivering gas to large industrial consumers. These stations are usually of the same type. Here it is essential that all regulators and meters have individual bypasses so that either can be worked on without shutting off service. It has been found that the use of two regulators to cut the main line pressure to the pressure at which the gas is measured (usually 25 pounds to 75 pounds) rather than one regulator, results in better regulation and eliminates freezing. This also makes it necessary to use heaters in most instances. Where the load may at times be shut off, or almost shut off, it is advisable to use two valves in the bypass, or a plug valve to eliminate pressure being built up through leakage of the bypass valve.

Where the volumes handled are small the high pressure positive displacement meter is usually used with pressure volume and time recording gauge. There should be a bypass around the meter. There should be a valve on the inlet of the meter and on the outlet should be a test tee, a valve and atmospheric tee and another valve. With both the outlet valves closed and the atmospheric tee opened, there can be no possibility of a back flow to cause an erroneous test. Where the specific gravity of the gas is constant or known, the most practical method of testing is with the critical flow prover. Where the specific gravity is variable it is advisable to use an aluminum test meter connected to the test tee by means of a large hose. Flowometers are also used for testing, but are not generally considered as accurate as the two methods first mentioned. Where dust and dirt are carried by the gas, it is advisable to install gas cleaners which are now very generally used. This eliminates excessive wear of the valves and other parts, the filling up of the diaphragm, and also eliminates the cutting out of regulator valves and seats.

Positive Meter Stations

Most companies use either 4,000 or 8,000 cubic feet per hour voluntary capacity as the maximum limit for positive meter stations, though this may vary according to normal conditions. Above these limits orifice meters are generally used. The methods of handling regulation in positive meter stations are also applicable here. The length of pipe before and after the orifice flange, the use of straightening vanes and the relative size of the orifice plate should conform to the preliminary reports of gas measurement committee of the Natural Gas Department of the American Gas Association.

It is important that the orifice plates have a square sharp edge, and it has been found that dirt built up around the orifice on the high side of the plate will cause low measurement. Where the gravity of the gas is variable it is desirable to install a recording gravitometer. Where the gravity is constant, it is general practice to take a monthly test with a gravity balance, either by testing in place with a field balance, or taking a sample to the laboratory.

Several pipeline flow formulas have been used in determining the proper size of line to lay and in determining pressure drops in lines. At the Kansas City convention the Bureau of Mines made a report of its investigations and experiments on this subject. From this report the Pipe Line Flow Committee has made a tentative recommendation to the effect that the Weymouth pipe line flow seems to be the most accurate.

Scientific Problems

The measurement of gas is rapidly coming to be recognized as a really scientific problem and one that is of very great importance, it being the cash register of the whole company, on which depends all of the income and a large part of the output of the company. The past few years have seen a great deal more interest taken in gas measurement, and a much better understanding of the principles involved, and a much better application of practical methods. The proper measurement of gas has been greatly furthered by the southwestern gas measurement short course, conducted at the Oklahoma University at Norman, Okla., each spring.

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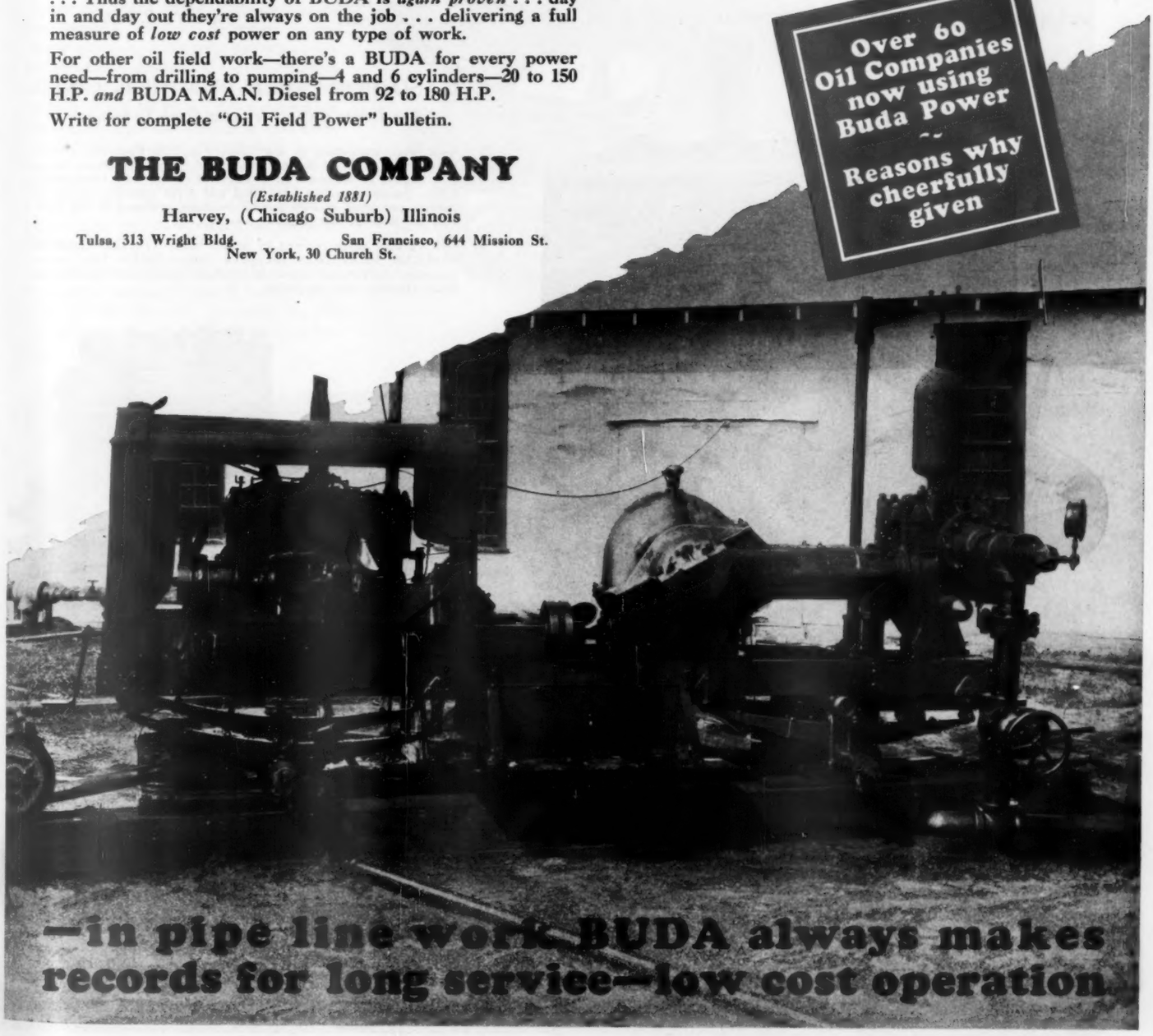

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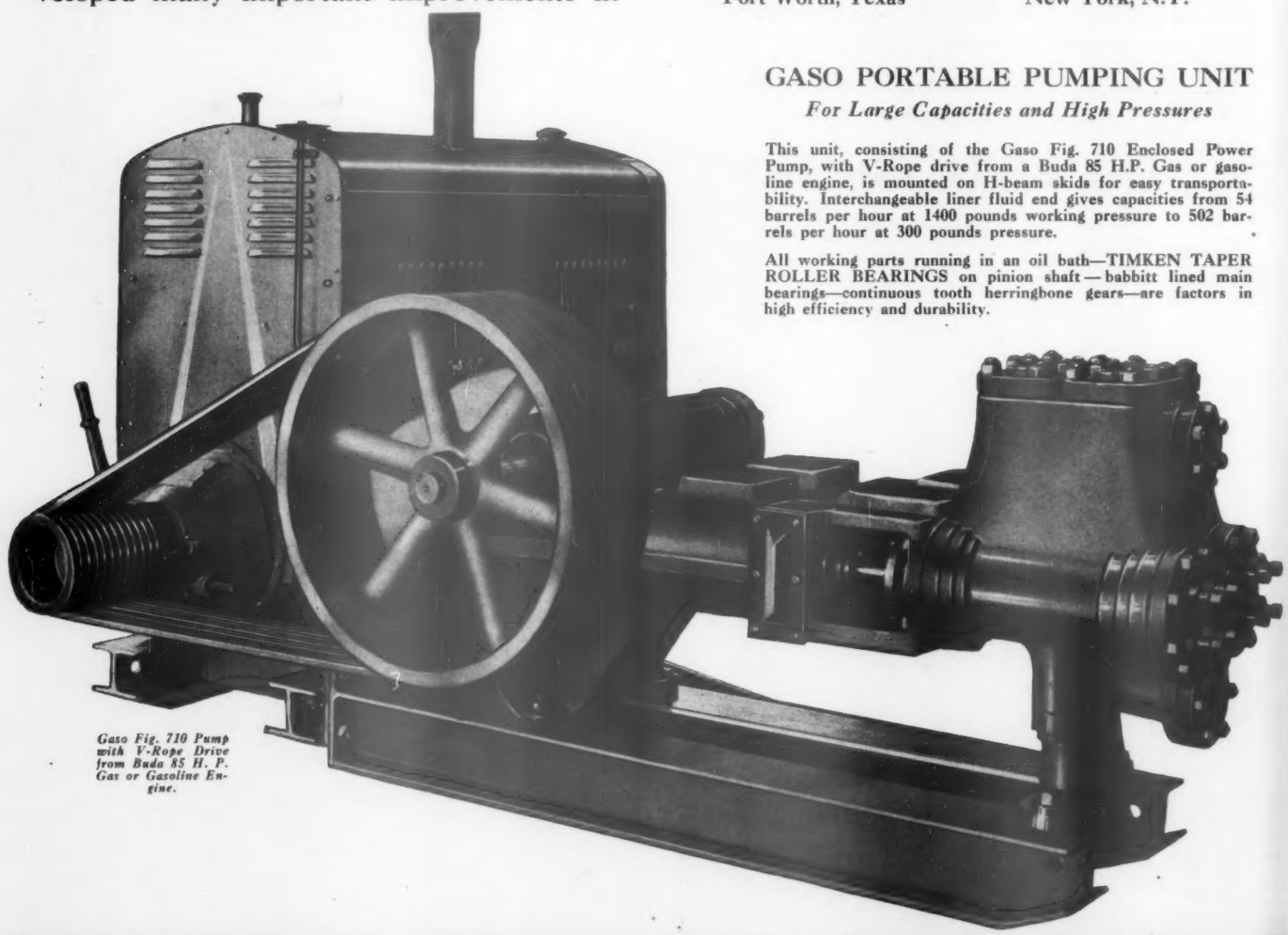

Gaso Fig. 710 Pump with V-Rope Drive from Buda 85 H. P. Gas or Gasoline Engine.

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GASO PORTABLE PUMPING PLANTS, Fig. 2010-W

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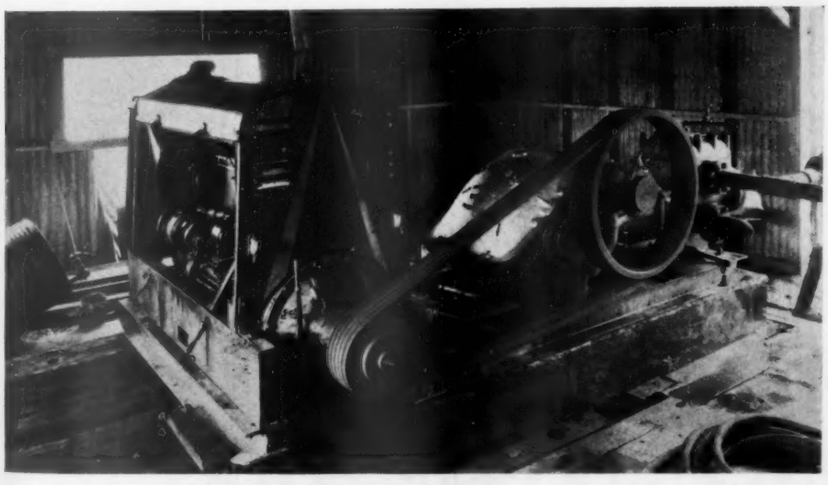
Gaso Fig. 2010-W Portable Pumping Plant



Gaso Fig. 1508 Pump with V-Rope Drive from Buda 50 H.P. Gas or Gasoline Engine.

GASO ALL TIMKEN BEARING PUMP, Fig. 1508

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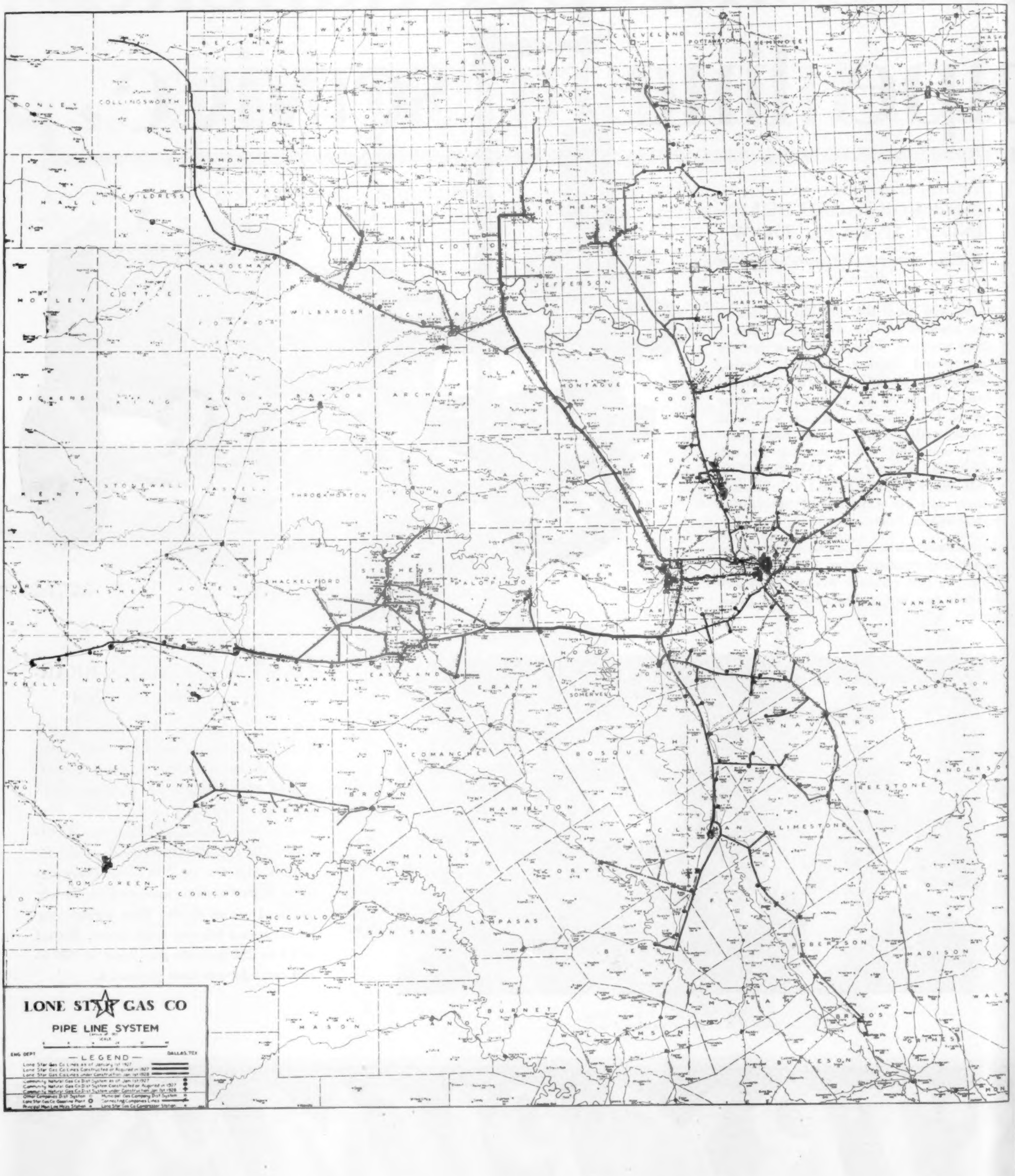
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Community Natural Gas Co Dist System as of Jan 1st 1927
Community Natural Gas Co Dist System Constructed or Acquired in 1927
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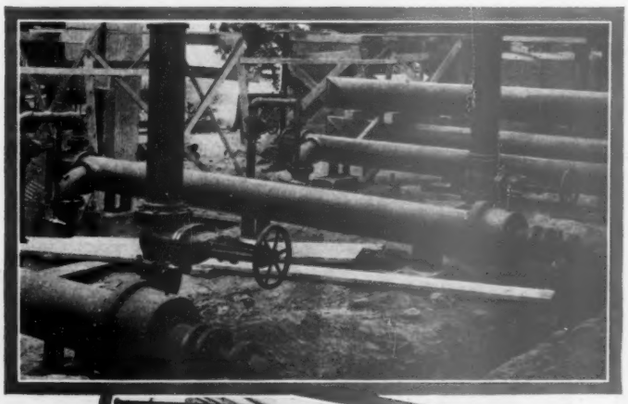

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Part of an installation of G-R Vaneflo inter coolers used with two-stage air compressors.

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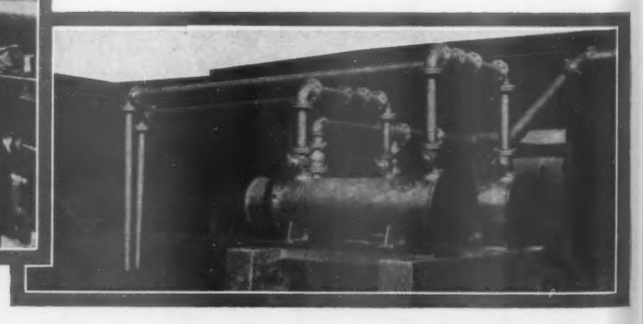

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Use of Electric Arc Welding Process

More Than 3,000 Miles of Pipe Lines Have Been Arc Welded or Are Now Under Process of Construction

By J. F. Lincoln,
President, The Lincoln Electric Co., Cleveland, Ohio

The application of the electric arc welding process to pipe line construction is comparatively new. Less than two years ago the first arc welded pipe line was completed. This was a 7-inch line for the transporting of gas from Lamkin to Hodge, La. The successful operation of this line proved to the pipe line world that a new, economical method of joining pipe was available through the use of

Figure 1—A 35,000-pound drop-hammer under 120 pounds steam pressure reduced a 12-inch butt welded joint (above) to 8⅞ inches diameter (below) but could not fracture the arc welded joint. Photo courtesy of Welding Engineering Co.

the electric arc welding process. So rapidly was the electric arc process put to use in the joining of pipe that today there are more than 3,000 miles of pipe lines which have been arc welded or are now under the process of construction. This phenomenal growth of the use of the electric arc process in pipe line construction has been due to the fact that arc welding makes possible strong and durable pipe lines at a low cost of construction and maintenance.

Figure 2—A typical bell and spigot with welding dam joint which has been tack welded.

One of the physical attributes of arc welded pipe line joints is strength equal or greater than the pipe itself. This is inherent with the electric arc welding process which fuses the weld metal into the pipe metal, so that when two pieces of pipe are joined by arc welding, they become literally one piece of pipe.

Time and again, pipe joined by arc welding has been tested in laboratory and field, the results always proving the strength of the arc welded joints. One unique test conducted in the field to satisfy pipe line engineers of the strength of this modern construction consisted of placing a 150-foot section of line composed of 5 lengths of pipe, each 30 feet long, joined by arc welding, on 1 foot high skids. The line was tested with 1,250 pounds hydrostatic pressure. No leaks developed, though each welded joint was beaten with heavy sledges while under this pressure. While still under this pressure, all skids were removed with the exception of those supporting each end of the line. While the line was thus supported, only at its extremities, an engineer jumped again and again on the middle of it. Still no joint broke or showed the slightest sign of leakage.

Another severe test recently conducted by a prominent firm of pipe line engineers again proves the strength and ductility of arc welded joints. An arc welded butt joint of 12-inch pipe was placed under a steam drop hammer. In an endeavor to throw the entire strain directly into the welded joint, a piece of channel iron, 12 inches in length, was inserted transversely into each end of the pipe. The dead weight of the hammer was 35,000 pounds. It was dropped on the pipe five times from the heighth of 1 foot and under 120 pounds steam pressure. The tremendous force of the five blows of the hammer reduced the welded joint from 12-inch diameter to 8⅞ inches diameter. No sign of fracture in the weld was detected, after this severe test. A "before" and "after" view of the arc welded joint is given in figure 1.

Many arc welded pipe joints have been pulled for test of tensile strength. In these tests the pipe metal shows fracture before the welded joint. Joints cut out of the Texas-Empire arc welded 12-inch line were pulled to 49,000 pounds at no damage to the joint.

Types of Joints

There are two general types of joints being used in arc welded lines. In oil lines the bell and spigot joint is the most popular. This type of joint consists of inserting a plain end of pipe into adjacent pipe, the end of which has been "belled" in manufacture to the extent that it will receive the spigot end for a distance of approximately 3 inches, with a maximum clearance of one-thirty-second inch. A variation of this type of joint is the bell and spigot joint with welding dam. The spigot end of the pipe is crimped in manufacture to form an inverted V-shaped ridge of pipe metal around the pipe at a distance of approximately 3 inches from the end of the pipe. When the spigot end is inserted in the bell end of a pipe length, the welding dam butts against the end of the bell. The purpose of the welding dam is to facilitate welding by forming a dam or backing for the welding bead on the spigot end of the joint. Figure 2 shows a bell and spigot joint with welding dam after being tack welded.

A plain joint or butt joint is also used in arc welded lines. This type of joint is formed by merely butting ends of pipe lengths together. The ends are beveled in manufacture, so that when joined a V is formed which facilitates welding this type of joint.

Method of Construction

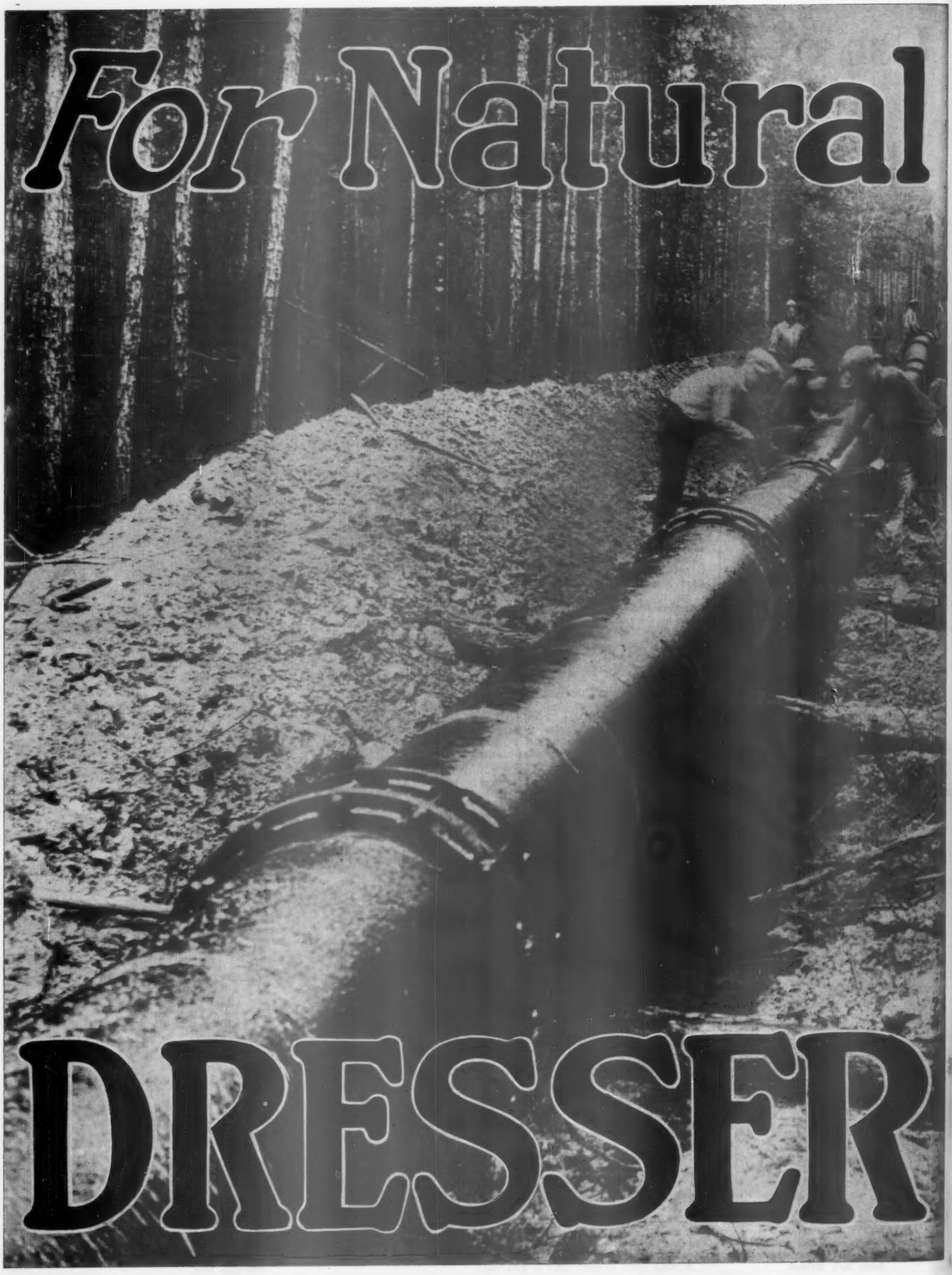
Clearing of the right of way, stringing of pipe, and ditching operations are the same for arc welded construction, as for other types. After the pipe is strung, it is lined up in sections consisting generally of four or more lengths, depending upon length of pipe and topographical conditions. In lining up the pipe into sections, when pipe has bell and spigot ends, the spigot ends are inserted in the bell ends of the adjacent lengths, thus forming a straight line of pipe. The entire section, thus formed, is blocked up level on wood skids parallel and about 3 feet from line of trench, as shown in figure 3.

Several devices are employed to aid the turning of sections, during the welding operations. Chock blocks are sometimes nailed to the top skids on which the section rests. These chock blocks are beveled on the face adjacent to the pipe, so that the section will turn easily against the chock blocks. The use of chock blocks also eliminates the necessity of long skids, as the pipe is not rolled on the skids, but is turned against the chock blocks. Long skids are heavy and cumbersome to handle. The placing of chock blocks on opposite sides of the pipe on adjacent skids also tends to keep the section in line before welding.

Figure 3—A section of line being welded. Note the use of wood skids for blocking up section so that it is level. Photographed on Texas Pipe Line Co.'s Monahans-Port Arthur, Tex., line.

A recent innovation, introduced on a

Figure 4—Showing a section placed on dolleys on top of skids to facilitate turning of pipe during welding operations. Photographed on Uinta Pipe Line Co.'s 200-mile line.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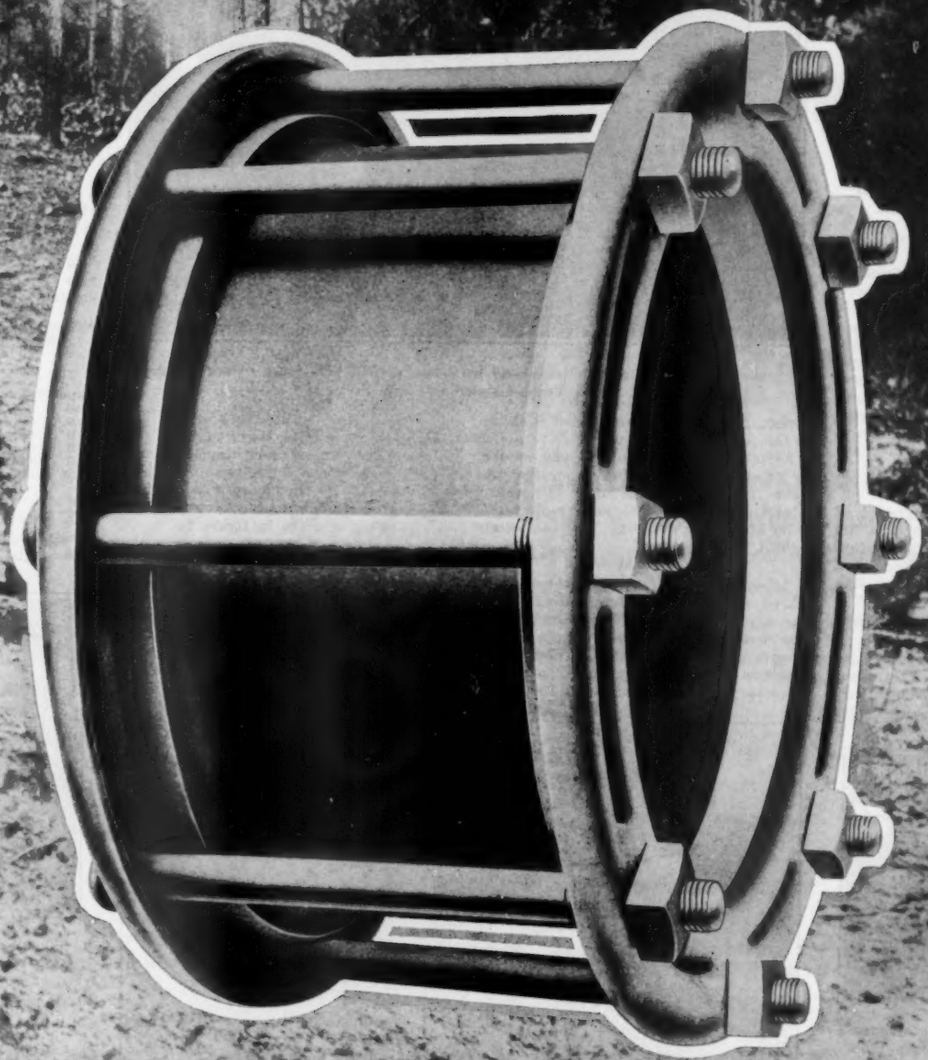

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large gas line, now in process of construction, is the use of dolleys placed on the top skids and on which the section rests. These dolleys are simple affairs, as can be seen from observation of figure 4. A dolley consists merely of a base which is a piece of channel iron with flanges upturned to serve as support for the roller axles, and two rollers mounted on each of the two axles. These

Figure 5—A typical burning-in weld in a plain bell and spigot joint.

dolleys are especially useful where large, heavy pipe is used.

When pipe with plain ends forming butt joints is used, the joints are tack welded immediately after a section is lined up. This is done to hold the section intact and in line until the joints are completely welded. Bell and spigot joints are sometimes tack welded to prevent misalignment of pipe, due to contraction and expansion of pipe lengths caused by abrupt changes in temperature. After the sections are lined up they are then ready for firing line welding.

Firing Line Welding

Welds made in a section composed of several lengths of pipe are known as firing line or rolling welds, as the section is turned or rolled while the joints are being welded, so that overhead welding is eliminated. The actual welding of a section is performed by one operator aided by his helper.

Generally the welder is spotted between two adjacent sections. The operator welds the top half of each joint, starting at the joint farthest from the welder

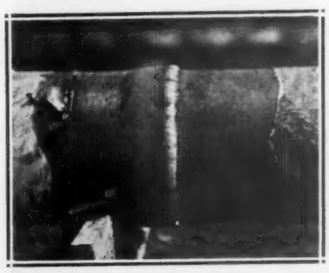

Figure 6—Showing portions of burning-in weld and finish weld in a plain bell and spigot joint. Photographed on Texas-Empire 600-mile line.

and works toward the next section to be welded. The helper follows, cleaning this first weld, known as the burning-in weld, with hammer, chisel and wire brush, removing all oxides, etc.

After the operator finishes the welding of the top half of the last joint in the section, the helper, with chain pipe wrench, turns the entire section 180 degrees. The operator then proceeds to complete the burning-in bead in each joint; the helper following, cleaning the balance of the welds, as before. A typical burning-in bead, after it had been cleaned, is shown in figure 5.

When the burning-in welds are completed, the operator is back at the original starting point having traversed the entire length of the section twice. The operator then starts welding the second bead, or finish bead, welding a complete joint, before moving to the next. The helper turns the pipe, as the operator welds the finish bead in each joint. In the entire welding operation, the operator traverses the length of each section only three times. The finish bead is not cleaned. This leaves the helper free to turn the section, so that the finish bead in each joint may be completed in one operation. Portions of the burning-in bead and finish bead in the same joint are portrayed in figure 6. A completed arc welded bell and spigot is shown in figure 7.

Figure 8—Operator welding overhead in making a bell hole joint. Photographed on Texas-Empire 600-mile line.

After the operator finished one section, he proceeds to the adjacent section and welds it in the same manner. The welder is moved by tractor, horse or mule team, only after two sections are completely welded.

Bell Hole Welding

After a section is arc welded, it is placed over the open ditch on single skids and joined to the end of the welded line. The welding of a section to the line is known as bell hole welding. This operation was so labeled, because it is generally necessary to dig out the sides of the ditch forming a bell shaped hole or space in the ditch to permit easy access to the entire circumference of the joint. A bell hole connection is the only joint which requires overhead welding, as it is impossible to turn the pipe line. Two separate beads are welded in making a bell hole joint, the same as required in making firing line connections, the procedure only being different. The operator first makes the burning-in bead in the top half of the bell hole joint. After this portion of the joint is welded, the helper cleans the bead while the operator continues to weld the lower half of the joint. The operator then stands by until the cleaning of the entire burning-in bead is finished. He then proceeds to weld the final or finish bead. A view of bell hole welding is given in figure 8.

Bending of a section to confrom to line of ditch is usually done immediately after the section is arc welded to the pipe line. All bends in a section are made, where possible, in the middle of a pipe length, rather than at a joint.

To take care of the expansion or contraction of the line, several methods are employed. Where expansion joints are not welded into a line, slack is put into the line by forcing the line into the ditch, so that it will lie on the bottom of the ditch, not in a perfectly straight line, but weaved from wall to wall of the ditch.

This method of weaving the pipe in the ditch is unnecessary where expansion joints are included in the line. On recent arc welded lines, expansion joints, similar to joint illustrated in figure 9, are used. This type of joint, when placed

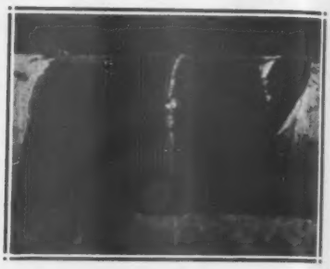

Figure 7—A completed arc welded bell and spigot joint. Photographed on Texas Pipe Line Co.'s San Antonio-San Marcus, Tex., line.

at intervals in the line, takes care of all expansion and contraction of the line.

Welding Speeds

The following table of welding speeds was compiled from actual time studies conducted on arc welded pipe line jobs:

NUMBER OF ARC WELDED JOINTS PER OPERATOR PER 10-HOUR DAY

Type of Joint	Size of Pipe	No. of firing line joints Aver.	Rec.	No. of Bell Hole joints Aver.	Rec.
Bell & Spigot	6"	18	35	14	24
Bell & Spigot	8"	25	40	16	20
Bell & Spigot	10"	22	28	10	20
Bell & Spigot	12"	12	25	8	14
Bell & Spigot with welding dam	16"	10	16	7	12

Welding Equipment

A type of welder used on pipe line jobs consists of a generator driven by a gasoline engine, both units being mounted

Figure 9—A type of expansion joint used in arc welded pipe lines. This type of joint is known in pipe line parlance as a "wrinkle-belly" joint.

on a structural steel base. The welders are either equipped with wheels or are mounted on wagon chassis. For pipe line welding, welders of 300 ampere capacity, powered by a 4-cylinder motor and 400 ampere capacity, powered by 6-cylinder motor, are most generally used. These types consume from 1 gallon to 1¾ gallons of gasoline per hour of operation and approximately from 2 quarts to 2½ quarts of oil per 10-hour day. A view of type of welder used on most pipe line jobs is given in figure 10.

Welding electrodes of mild steel having fast flowing and non-spattering qualities are used for pipe line welding. The sizes most generally used are three-sixteenth inch, seven-thirty-second inch and one-fourth inch. Often the burning-in bead is welded with three-sixteenth inch electrode and the finish bead with one-fourth inch electrode. The amount of current used in welding pipe line joints varies according to kind and size of electrode used and thickness of pipe being welded.

Figure 10—Operator making a firing line weld with welder in background. Photographed on Texas-Empire 600-mile line

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Oxy-Acetylene Welding On Pipe Lines

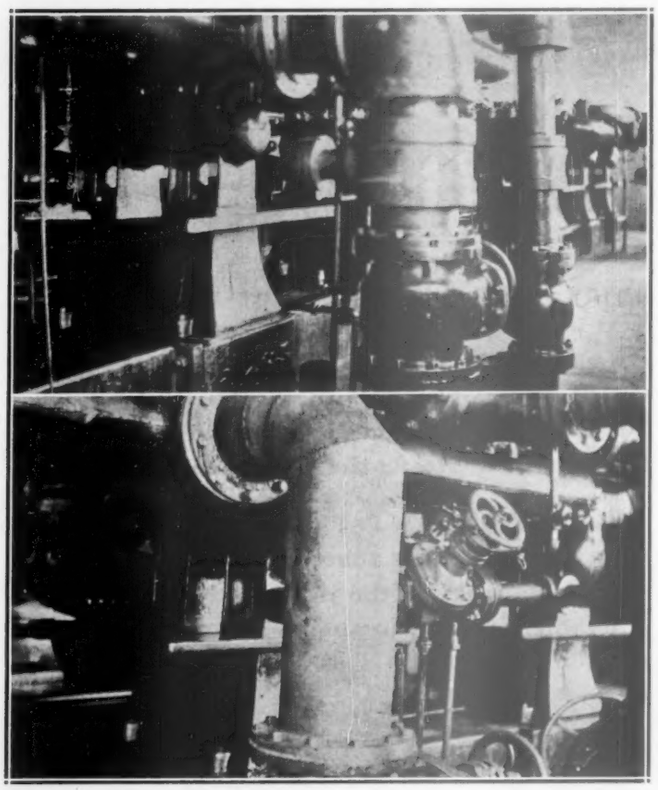
Well Defined Organization Necessary to Best Results. Details of Operations and Functions of Divisions

By N. E. Wagner
Prairie Pipe Line Co.

Much has been written concerning oxy-acetylene welding with respect to its application to the pipe line industry, yet it is agreed that it is impossible to lay too great a stress upon those fundamentals upon which rests the success of this phase of the industry.

Since first adopted, some 15 years ago, oxy-acetylene welding within the pipe line industry has so rapidly expanded that today it may be considered one of the outstanding features of the industry so far as the construction of a pipe line system is concerned.

Such a growth is a natural outcome due to the many advantageous applications of this process. The oxy-acetylene welded joint with complete penetration and suitably reinforced by a properly applied weld will have strength equal to or even greater than that of the parent metal in the pipe. The whole line to all intents and purposes becomes one long joint of pipe. The oxy-acetylene butt welded joint facilitates the transfer of liquids or gases at higher pressures with less loss due to friction than does the screwed or bell joint.



Comparison of pump connections made up with fittings and complete welded job with forged steel flanges.

In addition to the feature of application with marked advantage to pipe line construction, oxy-acetylene welding affords the user almost unlimited opportunity in its application to other projects in connection with the industry, such as speedy and reliable plant connections, manifolds, heating systems, lubricating oil reclaiming systems, etc. In addition the process is applicable to the reclamation of pipe for continued service; the construction of portable building fabrications, towers, pipe racks, field pump foundations, bridges, walks, tank stairs, machinery guard rails, pipe windlasses and other appliances necessary in pipe line construction and many other units, thereby affording a means for the consumption of junk pipe which is continually accumulating throughout a pipe line system. Repairs to machinery are quickly accomplished by this process.

Varied Uses

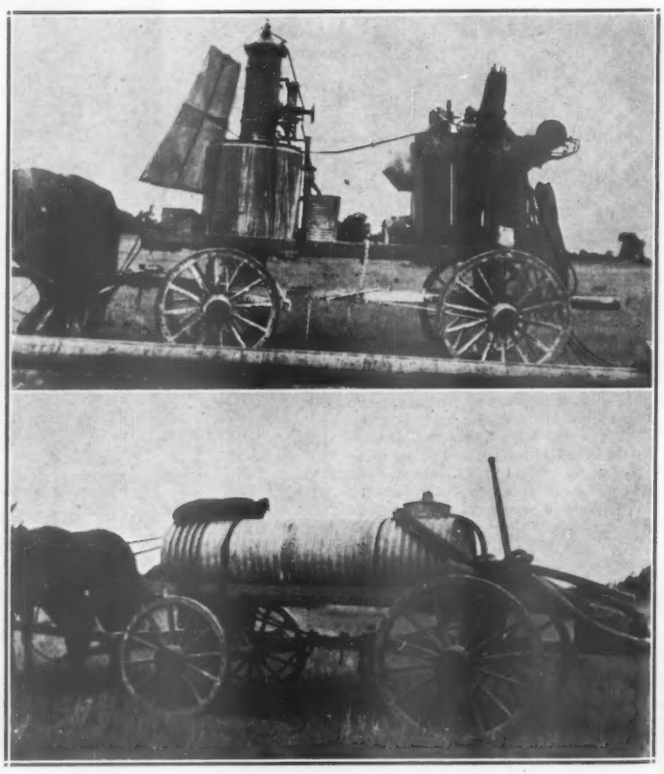
The uses of the oxy-acetylene process of welding offer so varied an application that a well-defined organization is necessary in order to obtain practical results and properly distribute the accomplishments made possible by the continued advances in welding. The resultant efficiency, success and progress of welding within the pipe line system is dependent upon such an organization working in co-operation with all other branches of the company.

Upon such an organization rests the responsibility of the selection, operation and maintenance of the welding equipment; the choice of welding materials; the training of welders; outlining progress of work in co-operation with various parties within the company at large who desire the services of welders; the organization of welding crews and assembling of welding equipment for trunk line construction or other major projects; the distribution of welders where needed throughout the system; inspection of work; accumulation of cost data; the study of the welding process and its advancement and numerous other details which are necessary to facilitate production on a profitable basis.

A welding department is in a position to enter upon a study of necessary operative equipment and after thorough investigation select that which will prove most reliable under all conditions. It is necessary that such a department follow the maintenance of equipment in service and keep all units in first-class operating condition at all times. Equipment is subject to frequent improvement and it is essential that the operator keep informed on such matters. It should also enter into the problem of the selection of welding materials, such as oxygen, carbide, acetylene, welding rod, etc., following the manufacturers' improvements on these various products as well as service available for convenient procurance of materials. In this manner the welding organization is in a position to afford best possible operative results to the entire pipe line system. There is absolutely no doubt that the selection of proper equipment and materials is one of the major issues of welding operations. This is especially true in the present-day trend toward pipe of higher carbon content and greater tensile strength for main trunk lines. The welder must have the best of materials so as to produce a welding flame through equipment adapted to ejecting the flame with the proper degree of regulation. The welding rod forms an important factor for its selection must follow specifications according to the grade of line pipe to be welded. Previously low carbon pipe was standard for oil carrying lines and a good grade of Norway iron welding rod produced the best weld but today in dealing with the higher carbon content pipe it is necessary that a special grade of welding rod be used which will properly fuse with the parent metal of the pipe so as to produce a weld as near as possible equivalent to the tensile strength of the pipe itself and yet have sufficient ductility to stand the required bending stress. Before entering into a construction involving high carbon pipe it is well to make actual test welds to assure the selection of a rod that will meet requirements.

Training of Welders

Special attention must be given to the training and instruction of welders. Once a department of welding is established and competent welders installed they should be accompanied, as much as possible, by a welder helper. The helper while assisting the welder in his constructions acquires a knowledge of various phases of the work and in the course of his employment learns to weld himself. In this manner future welders are made within the organization who are familiar with required methods. When additional welders are needed, due to natural expansion or large constructions, they are available to a large extent throughout the existing force so that it is not necessary to call upon so large a number of outside welders to meet the immediate situation. In any event there are sufficient regular employes to maintain a distribution of them among those employed temporarily for construction projects. Men who act as welding foremen on construction work are those who have been trained for such a capacity within the organization. Upon the completion of construction projects the welders and helpers, though the helper may have been welding on the project, return to various assigned locations throughout the system to resume routine welding. A definite set of instructions should be furnished the welder concerning certain details, such as safety instructions, care of equipment and materials, receipt of materials and equipment and the movement of same, proper manner of reporting time and materials used and many other important operative and clerical features



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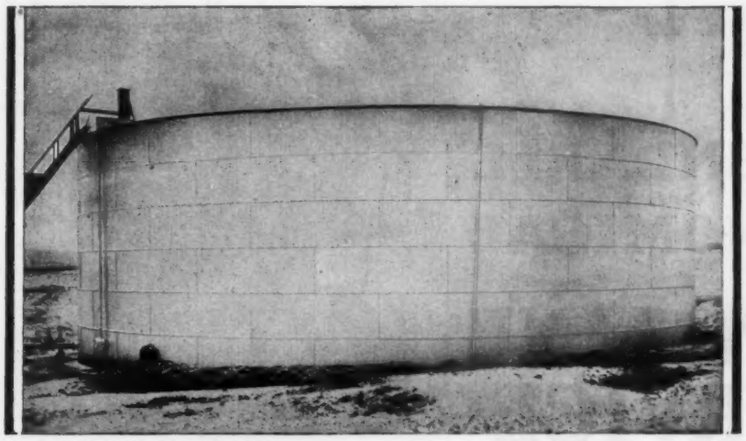

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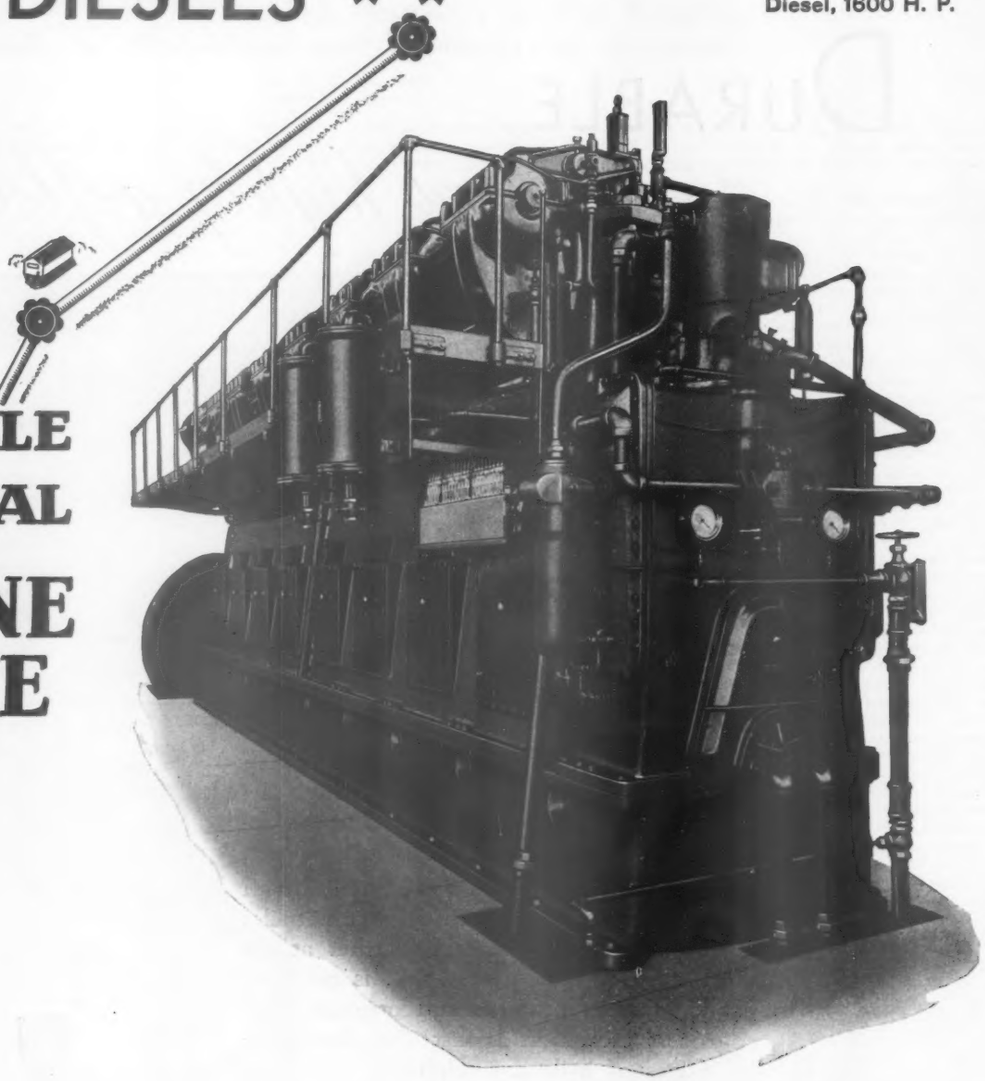

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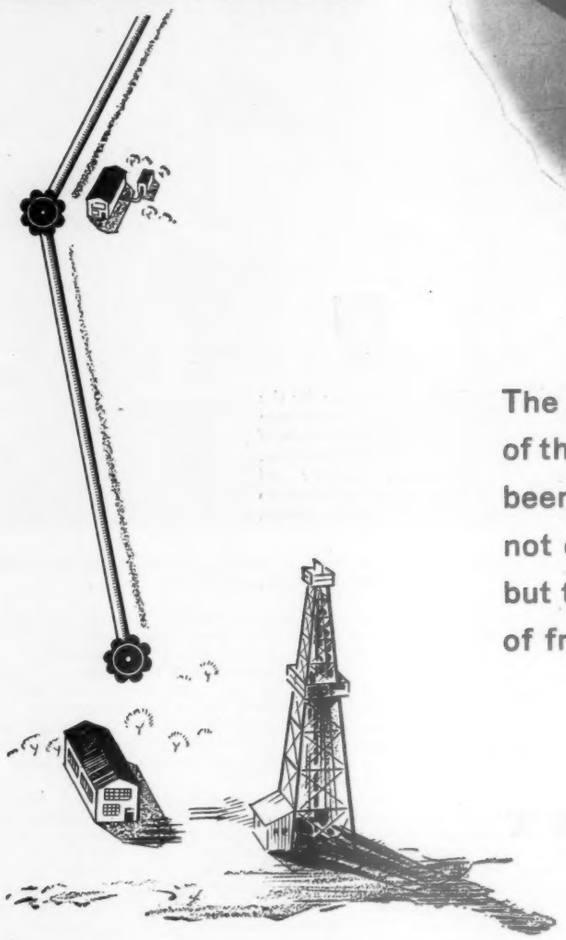

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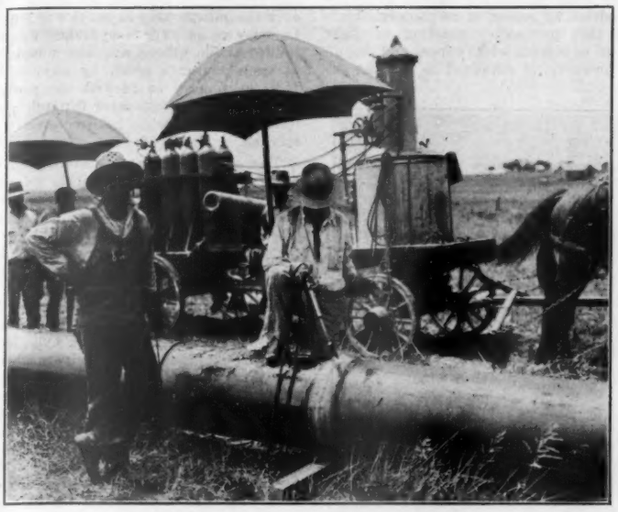

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necessary. Certain units are standard in their construction and each welder should be furnished with a set of blueprints covering all standard constructions.

Through the co-operation of the welding department with other operative departments continued new applications are formulated. Upon the adoption of some new constructive use of the process these new ideas must be distributed over the entire pipe line system. Thus the entire operative structure is benefited and such operations are not segregated simply for the advantage of any one particular locality, which might be the result if welders were divided under various separate departments. A department of welding should be equipped to furnish welders, equipment and materials throughout the entire system to take care of any and all

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requirements according to the needs of all other operative departments.

Welding is a special class of work and, owing to the diversity of the application and daily advancement, requires concentrated thought and attention for the accomplishment of definite results. Therefore, a special department is certainly necessary to cope with the situation in every detail.

Trunk Line Construction

Trunk line construction projects require certain specific methods of procedure according to existing conditions.

Long joint pipe, averaging from 30 to 38 feet is more desirable than the shorter lengths for the longer joints will naturally reduce the number of welds, thus facilitate laying, save time and welding materials. This length pipe is procurable from 4-inch up to 26-inch diameter size; when requirements are within these limits it will be found advantageous to use the long joint. The standard pipe for oxy-acetylene welding being plain end for butt welding, it is standard that the ends of pipe should be beveled to an angle of about 45 degrees to within one-sixteenth inch of the inside edge of the pipe.

When it has been decided to install a major pipe line it is very essential that strict attention be paid to the organization of welding crews. In this particular a company is benefited in having its own welding department for it then has personnel necessary to at least furnish direct supervision over actual welding operations as well as have a number of welders available who can be depended upon to produce the desired quality of workmanship. If necessary to call upon outside welders, whose ability is unknown, it is well that they be required to demonstrate their workmanship on one or more test pieces. The problem of procuring capable welders has become considerably lessened within the past few years due to the large number of young men who have adopted this particular trade.

The ordinary method of procedure for main line construction is to organize those gangs which affect the welding structure complete, dividing them into sections, each having a particular function.

First Welding Unit

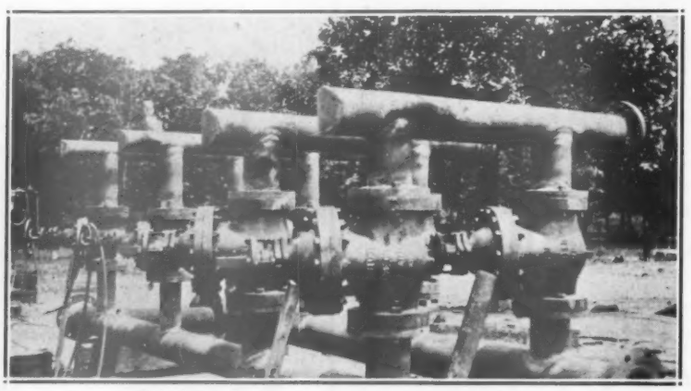
The first section of the welding unit consists of the pipe aligning gang under the supervision of one familiar with this line of work. This gang goes ahead lining up pipe in sections according to the adopted method of laying or welding for the particular job under way. Various methods are employed in aligning pipe and the method selected depends upon the size of pipe and laying conditions. The general usage favors supporting pipe on various size blocking placed so the pipe can be rolled during the process of welding each section. It is a good idea to keep at least five sections aligned ahead of welding crews with two or three sections remaining behind while welds are cooling. A team and wagon continues to haul blocking ahead for the aligning gang after sections are welded and rolled off blocking.

Two methods may be used to keep the joints in position after alignment. The one is to place a clamp, constructed for the purpose, around pipe, binding the ends of two joints where they have been butted together for welding. The other method is to place tack welds at regular spacings about the circumference at the joining of the pipes. This latter method is probably the most dependable, especially where pipe of larger diameter is being handled. It may be considered as economical also, for the amount of material and labor required for tacking will hardly exceed the expense required to place and remove clamps from pipe and move same along the line, not to mention possible cost due to loss of clamps in the course of construction or the maintenance of same as they become damaged. Also the initial investment is to be considered in view of the fact that quite a number are required and separate sets must be maintained for each size pipe placed in construction. The tack welder works in conjunction with the aligning gang. The rate of pay for the tack welder can be made less than the regular welder for one can be assigned to this feature who possibly is not fully capable of making a complete weld at speed of regular welders or one who is in the course of learning to weld.

When lining pipe of a high carbon content, of a size from 12 inches up where a special high carbon welding rod is required, there should be a spacing between ends of each joint averaging from one-eighth to three-sixteenths inch wide. This is necessary to produce better penetration when welding with the special grade of rod as well as take care of any amount of expansion or contraction which may be prevalent during welding.

The number of joints aligned to constitute a section for welding will be governed by the plan of the actual lay procedure. It appears to be generally accepted under ordinary laying conditions that pipes up to and including 8-inch can be aligned to the best advantage by hand power, while the larger diameters, especially long joints, are moved to aligning position by means of machinery adapted to this purpose, consisting of light tractors equipped with winch and boom. This, however, is governed to a great extent by the contour of the country. Where laying is over long stretches of level country even 6 and 8-inch pipes have been handled by machines with success. There are also places to which machines do not have access so that even the larger diameter pipe must be aligned to the major extent by hand power. One or two men should work in conjunction with the aligning gang swabbing each joint of pipe to remove debris which may accumulate in same. The proper aligning of pipe so that edges are in proper position for welding will greatly facilitate the welding operation and produce more satisfactory welds.

Reinforcing welds on heavy river pipe at South Canadian River.



Complete welded manifold, forged steel flanges.

"The Firing Line"

Following the aligning gang come the welding crews, commonly termed "the firing line." Several methods are employed for this feature.

As a general rule for ordinary constructions the firing line consists of from one to three 100-pound carbide capacity acetylene generators each mounted on a wagon with accompanying oxygen rack for each generator so as to accommodate the operation of four welding torches. To facilitate transportation and in order to have a composite unit, the generator is mounted on one end of a bed made of welded pipe framework with wood flooring, while on other end of bed are built racks of welded pipe capable of supporting from six to eight cylinders of oxygen. There is also space on this unit for a small additional supply of carbide. Oxygen racks have a capacity of from six to eight cylinders so there will always be a full cylinder in position for quick change over the minute one in service is emptied. In some cases oxygen cylinders are manifolded while others are direct connected to each separate torch by oxygen hose. It is customary to furnish the acetylene supply from the generator through a manifold to the separate hose connections to torches.

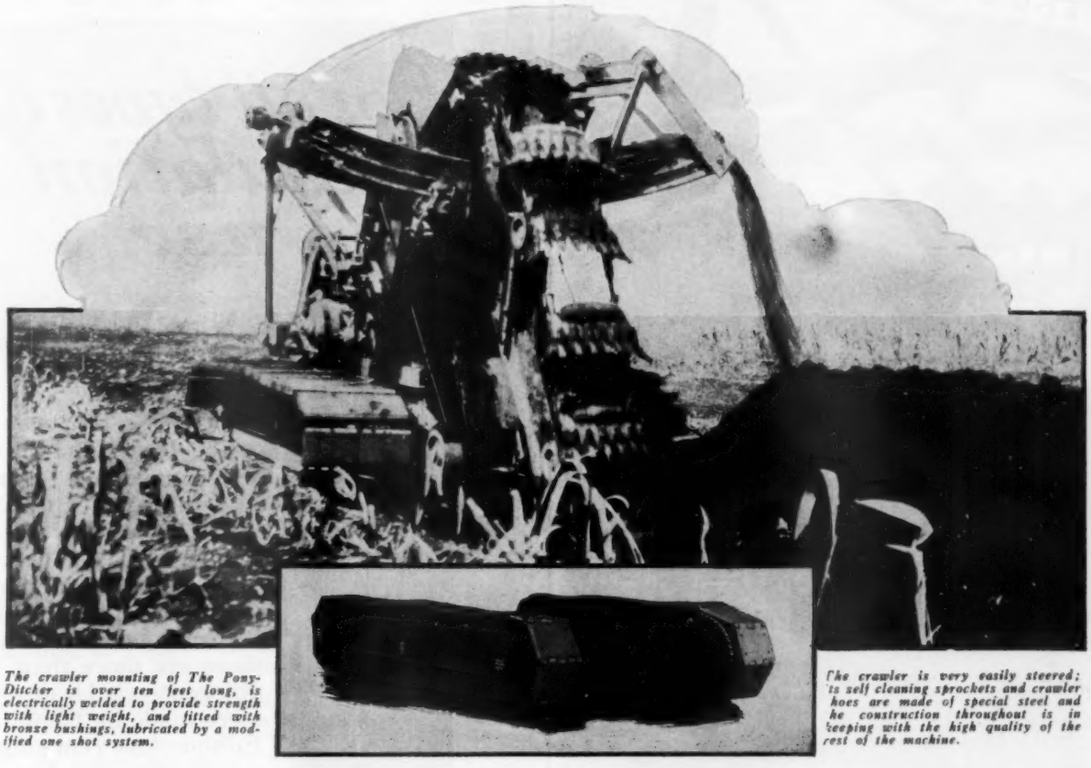
The single generator and oxygen rack beds are adapted to mounting on standard wagon trucks for transportation along the line, either by team or tractor. The single generator outfit produces gas for four welders making rolling welds on five joint sections previously aligned by the aligning gang. The generators are tended by two welder helpers who keep generator charged with carbide and water and make changes of oxygen cylinders as they are emptied. These helpers also roll the pipe as welds are being made and supply welding rod to the welder. As soon as the four welders take their places at each joint they start welding simultaneously and generally complete all welds at about the same time for welders of the same approximate speed are commonly assigned to work on the same section.

The welder helpers roll pipe by means of chain or pipe tongs or rope and mope pole device. No particular difficulty appears to have been incurred through this method of rolling pipe when same is aligned on blocking, even though large pipe in fairly long sections are handled. A device is receiving some attention at present whereby rolls can be applied to pipe by lifting ratchet supporting rollers so as to facilitate the rolling of large diameter pipe or long sections. However, the practibility of this method has not been tested to date. These rolls are intended for application during the roll welding process only, pipe having been previously aligned and tacked on blocking as it is not believed practical to attempt aligning pipe with any such device.

Meets Laying Conditions

As each single generator outfit completes its five joint section it moves to its respective section lined ahead. Under certain conditions the "firing line" procedure is specially arranged to meet laying conditions prevalent in the locality and adapted to produce the best results according to the size of pipe handled. Where speed is required and pipe is of large diameter, say 12-inch and over, double setups of the single generator outfits can be worked in unison on roll welding nine joint sections with eight welders to the section. Also two 100-pound carbide capacity acetylene generators with sufficient oxygen rack assembly can be mounted on specially constructed wagon beds to handle the nine joint sections at one setting. This double setting idea is generally not resorted to unless laying conditions are most favorable over a large expanse of level country where speed is a prerequisite and long sections can be aligned to an advantage. This previously mentioned method of gas supply units is moved along the line from section to section by teams or tractor.

Another method of furnishing gas to the "firing line" is through a mounting of two 100-pound carbide capacity acetylene generators on a wagon supplying acetylene for 10 welders. Under this arrangement oxygen is furnished to each operator from individual cylinders placed conveniently for him while the acetylene supply is furnished through piping from generators. Another system consists of two acetylene generators mounted on wagon used together with oxygen manifolded on same wagon, with both oxygen and acetylene distributed through small lines from 200 to 2,000 feet in length with outlets at convenient places, piping being moved ahead as the line progresses. These last two mentioned methods are adaptable to the laying of large diameter lines, such as 20-inch, and for rough country where permanent setups are necessary to make possible welding for as long a distance as possible before generating equipment is moved. The motive



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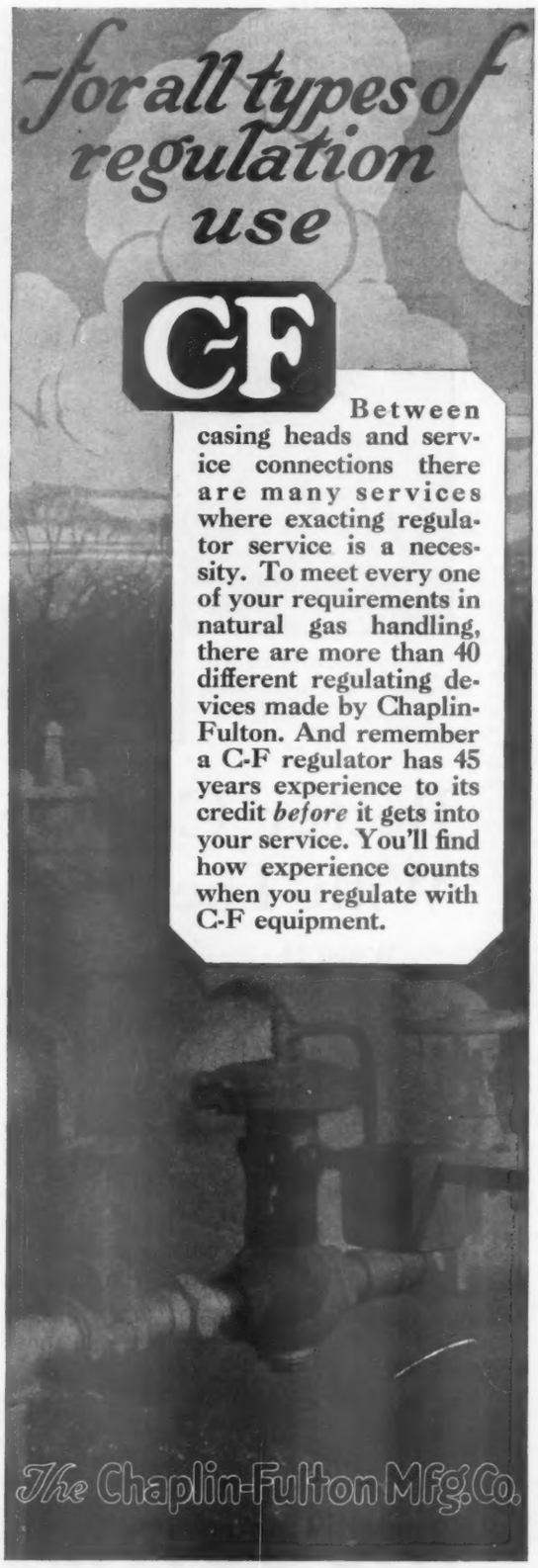
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power for the larger generator wagons is usually a tractor of appropriate capacity. Water supply is furnished to generators by tank wagons equipped with hand pump mounted on back end of wagon tank bed. In certain sections of the country where water is so scarce as to make it necessary to purchase same and the price is prohibitive the acetylene gas can of course be supplied from cylinders. In such cases the acetylene cylinders are mounted on wagon float and supply from same manifolded for distribution to welders. From the previous outline it is evident that the operations of the "firing line" or roll welding must be adapted to the particular construction involved and therefore thorough study is required to organize efficiently this phase of lay progress.

Continued Roll Welding

Where it is possible to have fairly straight runs it is advisable to make all possible welds on surface by continued roll welding of sections just completed by the "firing line," it now being understood that such sections upon completion are removed from blocking and lie on the ground. This particular method centers about the activities of that section of units which is termed the "swing gang." This gang consists of sufficient welders to keep up progress according to the speed of the "firing line" and the number of sections desired to be tied up. In addition there are helpers for the welders who assist them and roll pipe in connection with a labor crew also necessary to place pipe in alignment. Welders are equipped with swing wagon racks constructed to accommodate two sets of oxygen and acetylene cylinders for two welders. This rack will fit an engine bed of wagon with sufficient space for a few extra cylinders. Sections are pulled together by tractor or in some cases by pipe pullers or page jack according to length of sections. As soon as sections are aligned in position they are tacked by welders. Thus held, the sections are rolled, by pipe or chain tongs or rope and mope pole device, as welders make complete circular welds. Hence one "swing cart" unit with two welders will tie up three five joint sections in the middle thus forming a 15-joint section. By the addition of another welder, equipped with a two-wheel welding cart for moving cylinder of oxygen and acetylene, four five-joint sections are tied up, forming a section 20 joints long. This system of facilitating the general lay progress is especially adaptable to laying pipe up to and including 8-inch diameter, where "firing line" sections have been previously welded by the two or three single generator and oxygen rack units. The same procedure can be followed if desired on larger diameter pipe where sections have been welded by other orders of "firing line" assembly but is not as satisfactory as a method to be described later. These long sections, made by the "swing gang," are now ready for the final tie-in weld. This is done in connection with the bending gang. All welds in the final tie-up are necessarily "bell hole" welds, for it is impossible to roll long sections. It is therefore necessary to remove earth from underneath place where weld is to be made so as to permit welder to make an overhead weld. After bending crew has sufficient slack in line or bends made the ends of pipe are aligned and thoroughly tacked to hold pipe in position preparatory to start of "bell hole" weld. In some cases it is necessary that "bell hole" welds be made before bends can be made. Upon completion of "bell hole" weld or final tie-up the line should be ready for placing in the ditch.

On constructions involving pipe larger than 8-inch the "swing wagon" is at times supplanted by another plan. This process is designed to bring the bending gang up immediately behind the "firing line" and has been found to speed up considerably the general process of laying. The bending gang in this case is accompanied by a good welder who substantially tacks each section as they are aligned by bending gang after slack has been adjusted or before or after bends are made according to the proper procedure for making each particular bend. A sufficient number of welders necessary to keep close upon the advance of the bending gang follow accordingly making "bell hole" welds for the completed tie-up of sections tacked by bending crew welder. Two men following the bending gang will dig sufficient "bell holes" for operation of five or six welders. The bell hole welders are each equipped with a small sled made of junk pipe on which are mounted an oxygen and acetylene cylinder. Sleds are moved from section to section by team, one team being sufficient to keep placing five or six sleds.

Slacked line over rough country.

The advantage in this course of construction lies in the fact that the bending gang is never delayed waiting the completion of a bell hole weld which entails time on large diameter pipe and neither is the bell hole welder delayed by the bending gang. In this plan the bending gang simply distributes slack properly, makes bends, tacks and moved on.

It must be remembered that the welding feature controls the speed of construction and that progress is directly dependent upon the efficient organization of welding crews.

River Crossings

The laying of river crossings requires special attention. The pipe used on such constructions is generally heavier than the land pipe. Welds must be of high quality and as a rule they are reinforced by welding one-half inch by 1-inch by 7-inch mild steel ribs across the weld at regular spaced points about the circumference with the narrow edge over weld and extending to pipe on both sides. When such welds are made the use of the old style river clamp may be eliminated unless desired simply to give the line additional weight. Where channel is sufficiently narrow the pipe necessary to span same is welded into section on brink of channel and then pulled across. Pipe is pulled so as to throw an upstream curve in the line to offer resistance to current as well as to take care of settling. At times both ends of river crossings are allowed to hang free for several days permitting pipe to settle before tie-in welds are made on each bank. On wide streams with deep channels, such as the Mississippi River, it is necessary to weld up channel crossing joint by joint. Equipment for this work consists of a welding barge with boom and winch for aligning each joint. A smaller barge is towed in the rear of welding barge to act as a floater so as to keep pipe laid behind raised sufficiently to expedite aligning on welding barge at a proper angle, for when channel is deep the pipe will extend from water at too steep a grade to permit alignment of joints on the welding barge. In addition a small barge is necessary to move pipe from shore to the welding barge as work progresses and such a barge may be towed by gasoline launch. A steamboat is also employed to act in emergency in event of a storm or mishap which might break barge anchorage as well as to move barges out across channel where necessary or tow pipe carrying barge if desired.

Slack in welded lines is a problem to be solved by the engineer in charge of construction or handled in operation by the experienced pipe line man in charge of bending or lay progress. The proper amount and distribution of slack necessary is governed by such factors as temperature variations, type of ditch, size and kind of pipe and contour of the country. To obtain slack where working along an open ditch long sections of pipe are placed over the ditch on skids. At designated intervals in lowering, pipe skids are left across the ditch which causes pipe to form arches over the skids with pipe intervening reaching to the bottom of the ditch. These arches hold a definite amount of slack in reserve until work has advanced far enough that resistance will not allow the slack to creep forward and escape. For fast laying, and in order not to have bending gang impeded by debris or equipment from open ditch, it is customary that bending gang work ahead of ditch, throwing slack loops and also making necessary over bends and sags in the line along ditch right of way so that when pipe is placed in straight ditch the slack will be crowded into same with equal distribution. Welded oil carrying lines laid in the ditch at a reasonable depth below the surface, especially in the Mid-Continent Field, are subjected to comparatively small temperature variations, and it is therefore ordinarily unnecessary to provide for expansion and contraction other than placing slack in the ditch. However, it is necessary at times to use expansion joints on long, perfectly straight lines of large diameter, such as gas or hot liquid lines, to take care of expansion and contraction.

The use of oxy-acetylene process in the pipe line industry is not only adaptable to the laying of lines but also functions with practical and economical results in the taking up of existing lines for relaying by this process. There is available at the present time apparatus for guiding oxy-acetylene cutting blowpipes to cut the pipe in such a way that it is ready beveled for relaying.

The matter of permanent tightness is important in connection with temporary lines. Some have gained the wrong impression that it is impracticable to use welding on gathering lines that are laid with the idea of being moved to some other location at an early date. However, by the employment of the oxy-acetylene welding blowpipe and cutting machine, such temporary lines can be installed as economically as other types of construction with the added assurance of a leak proof joint. When taking up old screw lines for relaying, where old collars are defective, it has been found practical to cut out the old leaky collar and relay as a welded line. When pipe has been previously laid by welding and it becomes necessary to take up and relay the line, the matter of location of joints does not necessarily need have anything to do with the operation of breaking the line for moving. For instance if a line was originally laid from 20-foot length pipe, the cuts in taking up the line may be made approximately 40 feet apart regardless of the location of the former welded joint. The procedure will cut in half the labor of taking up and relaying. A number of major pipe line companies are now adopting this method for constructing gravity lines of the larger diameters.

Existing pipe lines may be reconditioned to an advantage by this method, especially where it is desired to cut out defective pipe and weld in new joints. In reconditioning old screw lines it is policy to cut out old collars and weld in plain end pipe.

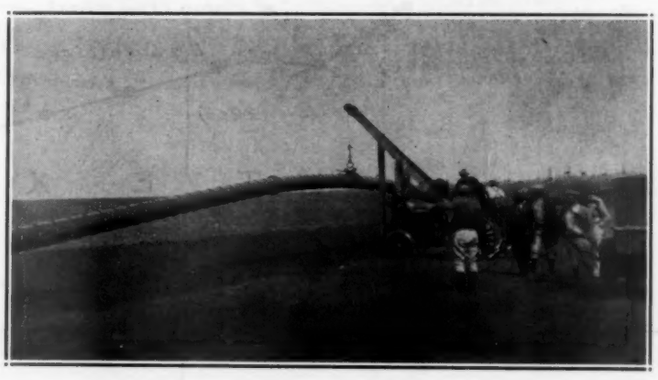
At the pumping plant the use of the oxy-acetylene process has, in a number of instances, become almost indispensable for construction and maintenance. There is no comparison between the old screw method of making necessary connections and that of the up-to-date welded connection. The use of special fittings is always costly and in addition such fittings are cumbersome to handle, and after installed may crack or break under pressure causing additional loss to the operator. The oxy-acetylene welding blowpipe in conjunction with the cutting blowpipe and the use of templets will develop almost any type connection or fitting desired. Connections or fittings which are thus quickly produced are light and if properly constructed are leak proof. In the majority of cases the welded fitting can be made to conform to any desired angle of approach. Welded lines in the station yards can be handled to advantage for the line is flexible and bends can be made on long or short radii without injury to the weld. In repairs and general maintenance to machinery the oxy-acetylene process has continually come to the fore to save many costly shut-downs while waiting for replacements on defective units, and at times repairs are so effective that it is not necessary to procure replacements.

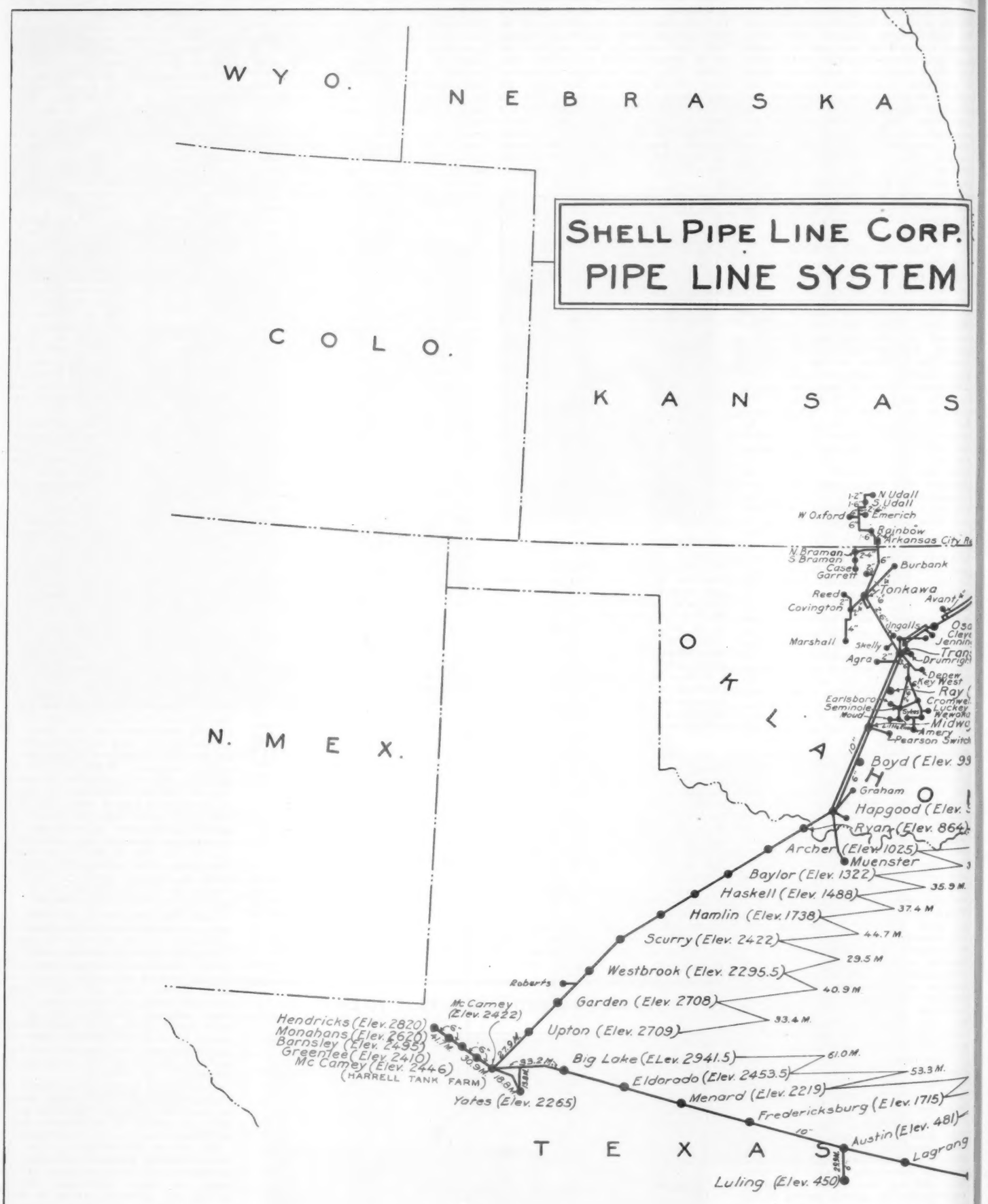
About the plant and in the field the junk pile becomes an asset, for junk pipe and boiler or tank iron take the forms of portable buildings; stairways and platforms to tanks and pumping units; tank towers; bridges and walks; fences and cattle guards; truck beds and foundations for small field pumps and many other necessary structures such as exhaust heating radiators for pump houses, frames for shop work benches, pipe supports for gravity lines, stands for oil barrels and other items too numerous to mention.

Oxy-acetylene equipment is adapted to convenient moving, for a station welder equipped with small cart has access to almost any portion of the premises without inconvenience to other operations.

The modern trend of the pipe line industry toward increased efficiency of construction and operation cannot fail to grasp the many advantages offered through this particular process of welding and cutting, as it may be adapted to their requirements when properly supervised, so that each year will show continued interesting developments working to the advantage of the industry in general.

SPIRAL WELDED LINE IS EASY TO LIFT

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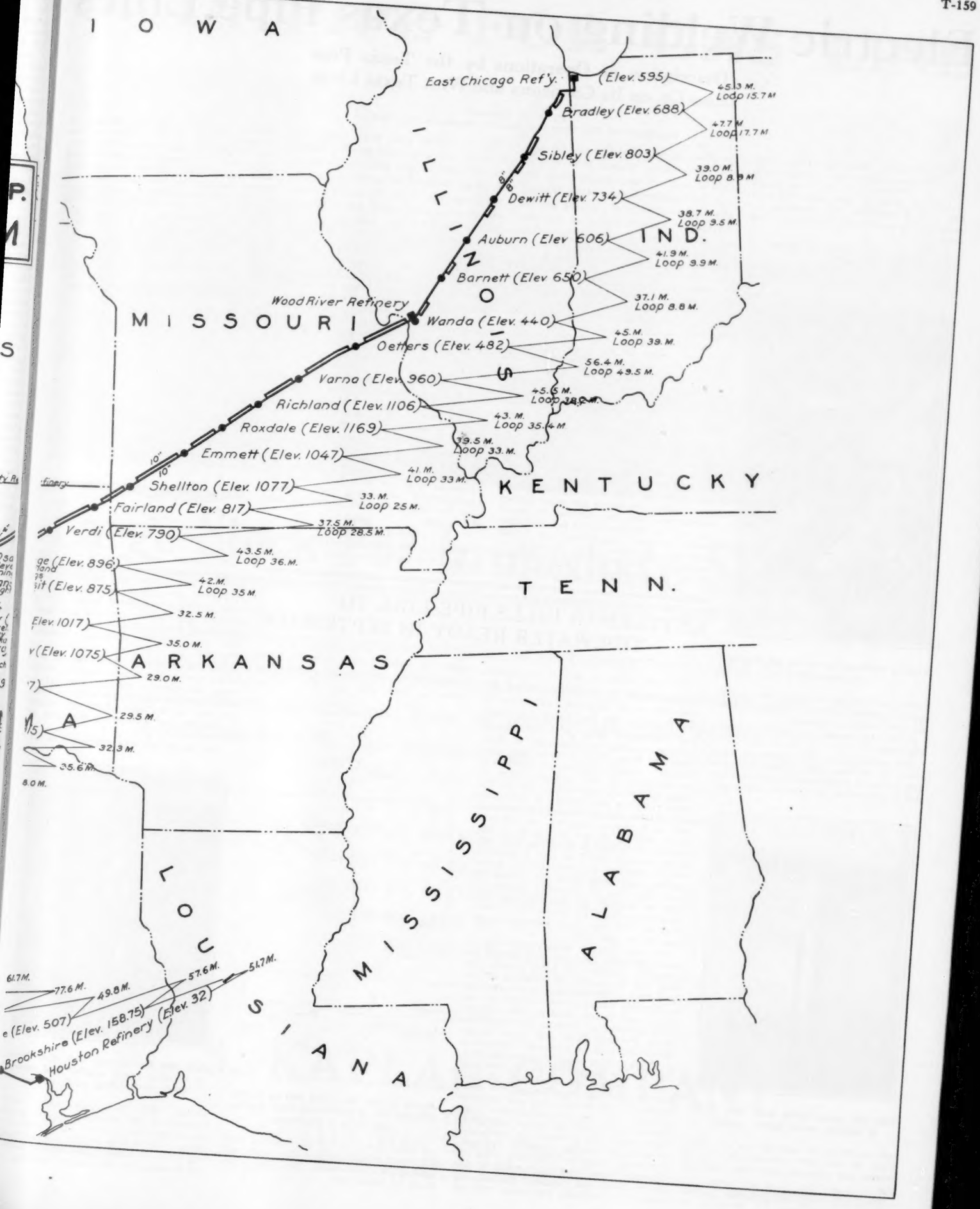
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ARKANSAS
MISSISSIPPI
ALABAMA
LOUISIANA
Wood River Refinery

Electric Welding on Texas Pipe Lines

Description of Operations by the Texas Pipe Line Co. on Its Corsicana and West Texas Lines

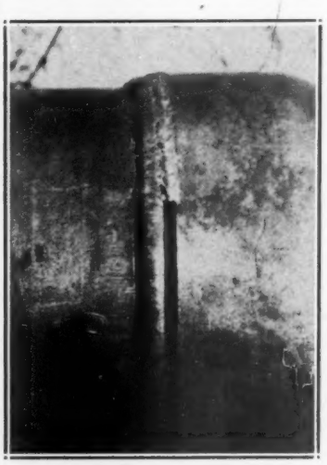
By J. B. Alleman
Superintendent, The Texas Pipe Line Co., Beaumont, Tex., Division

In September, 1928, The Texas Pipe Line Company began construction of 365 miles of 8.58-inch O.D. pipe line, which is believed to be the first major oil pipe line project involving the following innovations in usual pipe line construction methods:

1. The use of a large percentage of pipe in joints 60 feet long.
2. Protection of pipe against corrosion by application, at pipe mill, of asphalt coating and asphalt saturated felt jacket, applied spirally with a continuous coating and wrapping machine.
3. Bell and spigot type joints, electrically welded.

The reduction of the number of field joints by utilizing pipe in 60-foot lengths was found to be economical and practicable in sections of the country where general conditions of right of way and highways did not offer serious difficulty in hauling and stringing such long joints of pipe.

Cutting machine for cutting out coupons in operation.



Bell and spigot joint with first layer of welding metal partly applied.

The application of asphalt coating and asphalt saturated felt wrapping at the pipe mill was successful and the damage to jacket in transit from mill to right of way was surprisingly small. The only field application of coating required was a minor amount of patching and the covering of a short section on the bare end of each joint of pipe after welding.

This article deals primarily with the electric welding of a 146-mile section of the line between Corsicana and San Augustine, Tex. Subsequently approximately 700 miles of larger diameter pipe has been electrically welded by The Texas Pipe Line Company in its new line from Port Arthur and Houston to West Texas.

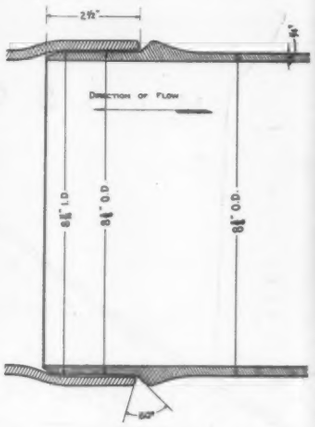
The pipe used in the initial electric welding project of 365 miles was open hearth steel, with carbon content of .20 to .30, outside diameter 8.58 inches, wall one-fourth inch thick, weighing approximately 23.3 pounds per lineal foot and tested to 1,200 pounds hydrostatic pressure at the mill.

Welding Operation

The trench was dug in front of the laying and welding gangs. After stringing the pipe along the right of way and just before starting welding operations each joint of pipe was swabbed to remove rocks, dirt, leaves and other foreign substances, and the exterior of spigot end and the interior of the bell end thoroughly cleaned. A number of joints, varying from three to six, depending on contour of the ground, were then lined up on skids and joints tacked in place with the electric arc. Each welder was supplied with a portable gasoline engine-driven direct current generator, with an amperage range of 50 to 300 and a voltage range of 20 to 25. To each generator was attached a section of rubber covered flexible cable for the electrode and another shorter section of cable with ground terminal of convenient shape to form contact with the pipe. The welding rod serves as the electrode. The welds were applied in two layers, the first with welding wire, or rods, five-thirty-seconds inch diameter and the second layer with rods three-sixteenths inch diameter. In the process of welding the sections the welder's helper turned or rolled the pipe so that the welding operation would always be at or near the top side of the pipe. After application of the first layer of welded metal, which on the 8.58-inch O.D. pipe was five-sixteenths inch wide at the base, the weld was then thoroughly cleaned of all oxidized metal, scale, or other foreign substance, and the second and finishing layer of metal applied in the same manner, producing a completed weld with a base of one-half inch to nine-sixteenths inch and an outside diameter approximately one-eighth inch larger than the outside diameter of the bell end of the pipe.

Bell Hole Welds

Following the sectional welding, as described, the pipe laying crew placed the various sections in the line, making the necessary bends to fit contour of bottom of the trench and alignment of same and a bell hole welder applied the final weld in the same manner as described, except that on the bell hole welds it is necessary for the welder to start work at the bottom and work upward around the pipe instead of having the pipe rolled or turned for him permitting all work to be done on top.



Bell and spigot joint.

All finished welds received the close scrutiny of experienced inspectors before any pipe was lowered into the trench and at various intervals coupons or sections were cut from completed welds with a portable hand milling machine and these specimens were subjected to laboratory test for strength, ductility, penetration, etc.

On this 8.58-inch O.D. line it was found that under normal working conditions one electric welder, with helper, could complete an average of three welds per hour on the pipe which was welded in sections and two welds per hour on bell hole welds.

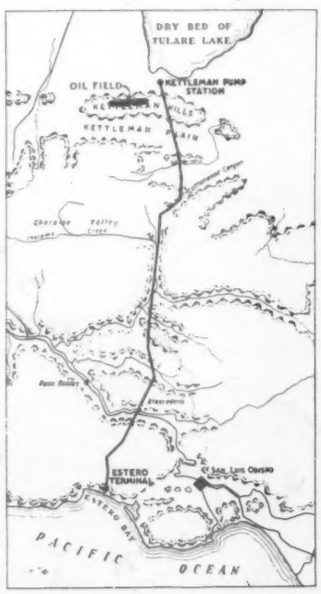
The entire line was completed in December, 1928, and tested under water pressure of 900 pounds to 1,000 pounds per square inch and has since been operating in oil service at 750 pounds working pressure without any defects having yet developed in the electric welding.

Bell and spigot joint with first layer of welding metal applied and second layer, or finishing weld, started.

KETTLEMAN HILLS PIPE LINE TO TIDEWATER READY IN SEPTEMBER

The only crude oil line of any consequence started in California during the past year is the projected installation of the Standard Oil Co. being laid from the Kettleman Hills Field of Kings County westward to tidewater at Toro Point on Morro Bay, north of San Luis Obispo. Actual construction work was started early in July and the entire 75 miles of 10-inch welded line will be finished within a few weeks. It will probably be the end of September before it will be in actual operation, as the company will be obliged to install a submarine line into Morro Bay and construct storage facilities and a pumping unit to facilitate tanker loadings. A connection was made with the Union Oil Co.'s pipe line at Shandon around the first of August and the Standard will temporarily load its oil at the Union's dock at Port San Luis pending completion of the new line.

The new line is being constructed of heavy seamless pipe and will sustain an operating pressure of 1,000 pounds per inch and be capable of handling 35,000 bbls. daily. Much of the route is through moderately rolling country where no unusual pipe lining problems are encountered although in crossing the Kettleman Hills, Pyramid Hills and Coast Range Mountains west of Atascadero some fairly rough country must be contended with. Soil surveys along the right of way indicate a variety of conditions although much of the line runs through soil which appears quite noncorrosive and therefore permits the use of unprotected pipe. Across several of the valleys soil conditions appear to warrant the application of specially wrapped asphaltic treatment commonly used in California. In the Cholame Valley there is a stretch of very severe alkali and the pipe has been encased in a redwood box filled with asphalt. A terminal tank farm is being constructed at tidewater at a slight elevation on some hills just back of the sea coast and this will be connected with a 16-inch submarine pipe line which will extend out into Estero Bay for a distance of 3,000 feet.



Route of pipe line being laid by Standard Oil Co. of California from Kettleman Hills to tidewater.

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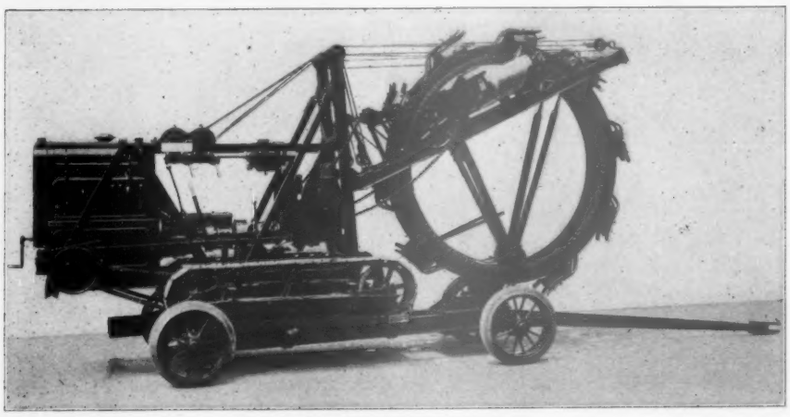

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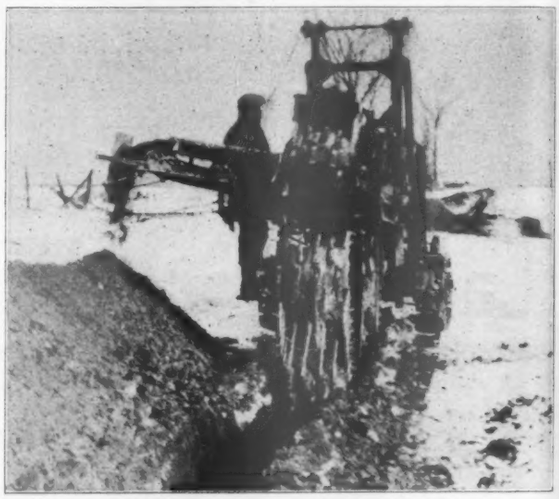


Meeting Tough Conditions
3½ feet per minute through real frost with the thermometer close to zero on this pipe line job.

Low weight for stability when working in rough country. Cut shows machine digging across 28% grade.

THE BABY DIGGER

The Design of Oil Trunk Pipe Lines

Mathematical Equations and Graphs Prepared to Simplify Work of Engineer in Determining Best Type of Line Needed

By Oscar Wolf
Assistant Chief Engineer, The Texas Pipe Line Co., Houston, Tex.

A MOST NOTABLE CONTRIBUTION

The Oil and Gas Journal is deeply indebted to Mr. Wolf for the privilege of publishing the accompanying article. It believes this article is one of the greatest contributions to pipe line engineering ever prepared. It covers subjects not ordinarily found in technical literature and represents hard work and intensive research upon the part of Mr. Wolf covering a period of approximately 10 years. It is a veritable text book on pipe line design and this publication feels it will be of great benefit to pipe line company engineers and other technicians.—A.M.R.

In 1883 Prof. Osborne Reynolds performed a series of beautiful experiments in connection with the flow of water through long pipes. By introducing colored liquids into the stream he observed that under certain conditions the flow was stream-line in character, and eddying or turbulent at greater velocities.

From the study of the equations of fluid motion Reynolds obtained his clue that the character of motion, whether stream-line or turbulent, depended upon a criterion which may be expressed as

$$\frac{Dv\delta}{\mu}$$, in which

D = Diameter of pipe (feet),
v = Velocity of fluid (ft. per second),
δ = Density of fluid (lbs. per cu. ft.),
μ = Absolute viscosity (ft.-lb.-sec. system),

and that the change from stream-line to turbulent motion took place when

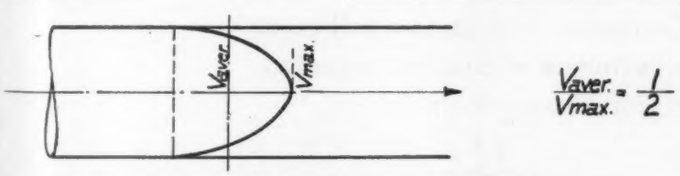
$$\frac{Dv\delta}{\mu} = 2{,}000 \text{ to } 2{,}500.$$

This expression is sometimes referred to as Reynold's Criterion or Reynold's Number.

Reynolds, however, overlooked the importance of the function $\frac{Dv\delta}{\mu}$ as an argument of general application in fluid friction for fluids of any viscosity.

Stream-Line Flow

Oil has a tendency to adhere to any metal surface. On account of this tendency the outermost cylinder of oil moving in a pipe moves but very slowly. Each succeeding cylinder may be regarded as sliding over its neighbor like an unfolding telescope. The velocity with which each cylinder moves through the pipe increases from the wall toward the center, and if we plat these velocities over the diameter of the pipe the following figure results:



Velocity of fluid during stream-line flow

The ratio of the mean velocity over the section to the velocity at the center is ½.

Turbulent Flow

Let it be assumed that the rate of flow be increased to a point where the velocity reaches the value expressed by

$$\frac{Dv\delta}{\mu} = 2{,}000 \text{ to } 2{,}500.$$

The velocity is then said to have reached its critical value, for at this point, according to Reynolds and many other investigators, a sudden change in the mode of flow is seen to take place. This transitional, or critical, region shows a sudden breaking down of the stream-line character of the flow into a swirling or eddying motion. There is also a noticeable increase in pressure, and the ratio $\frac{V_{aver.}}{V_{max.}}$ rises at once to 0.7 and increasing to 0.82 for eddying or turbulent flow.

(See Diagram 1)

The Resistance to Flow

It has been shown by Lord Rayleigh that the resistance of bodies immersed in fluids moving relatively to them, under the assumption that this resistance depends on the linear dimensions of the body and on the velocity, density and kinematical viscosity of the fluid, may be expressed by the equation

$$R = \delta v^2 F\left(\frac{lv}{n}\right)$$

where R is the resistance per unit area, l the linear dimension of the system, and n the kinematical viscosity (ft.-lb.-sec. system). See also "The principle of dimensional homogeneity" by E. Buckingham.

The numerical evaluation of this equation was carried out in a series of careful observations at the National Physical Laboratory, London, by Dr. T. E. Stanton and Mr. J. R. Pannell. At the suggestion of Lord Rayleigh the results were plotted with $\frac{R}{\delta v^2} = f'$ as ordinates, and $F\left(\frac{dv}{n}\right)$ as abscissas. The resulting curve shows in a striking manner the two regimes of flow, stream-line and turbulent, and also the point of critical velocity.

Similar observations were made by Lander, who carried out some experiments on the flow of steam and water in commercial pipe. Lander's data, when plotted in the manner described above, show that his coefficients of friction are slightly higher than those obtained by Stanton and Pannell.

Making similar observations at the Massachusetts Institute of Technology, Kite and Kennedy obtained results agreeing closely with those of Lander. Their experiments were performed on 1-inch, 2-inch and 4-inch pipe, with crude oils of 15.7 A.P.I. and 25.0 A.P.I. respectively.

Applying these same principles to a commercial pipe line, William G. Heltzel, of the Sinclair Pipe Line Co., determined the friction factors for 8-inch and 12-inch pipe under actual pipe line operating conditions with oil 37 degrees A.P.I. in gravity.

(See Figure 2)

The curves of the different investigators are plotted on the composite diagram.

The equation $\frac{R}{\delta v^2} = F\left(\frac{lv}{n}\right)$ is general and applies to all moving surfaces, in any fluid, liquid or gaseous.

For pipes,[1] the equation becomes:

$$G = \frac{\delta v^2}{D} F\left(\frac{Dv\delta}{\mu}\right), \text{ in which}$$

D = Diameter of pipe (ft.),
δ = Density of liquid,
v = Velocity of flow (ft. per sec.),
μ = Absolute viscosity of liquid (ft.-lb.-sec.),
L = Length of pipe (ft.),
$G = \frac{h\delta}{L}$ = Hydraulic gradient.

The total friction head of the line (ft. of head)

$$h = \frac{GL}{\delta}$$

Combining these equations with the well-known Darcy formula

$$h = \frac{f'Lv^2}{2gD}, \text{ we get}$$

$$G = \frac{f'\delta v^2}{2gD} = \frac{\delta v^2}{D} F\left(\frac{Dv\delta}{\mu}\right)$$

hence $$f' = 2gF\left(\frac{Dv\delta}{\mu}\right)$$

In the solution of practical pipe line problems, especially in the case of compound and looped lines, a change of units in the formulas just developed will simplify things materially.

In place of the argument

$$f' = F\left(\frac{Dv\delta}{\mu}\right)$$

we will use

$$f = \phi\left(\frac{SQ}{d\mu}\right) = \phi\left(\frac{Q}{dn}\right)$$

which expresses the same thing and in which

S = Specific gravity of oil,
Q = Rate of flow (bbls. per hr.),
d = Diameter of pipe (inches),
μ = Abs. viscosity (poises),
n = Kinematic viscosity,
ϕ "is the function of."

With these units the Darcy formula changes into:

$$P = \frac{fsLQ^2}{d^5}, \text{ where}$$

L = Length of line in miles,
P = Friction head in lbs. per sq. inch.

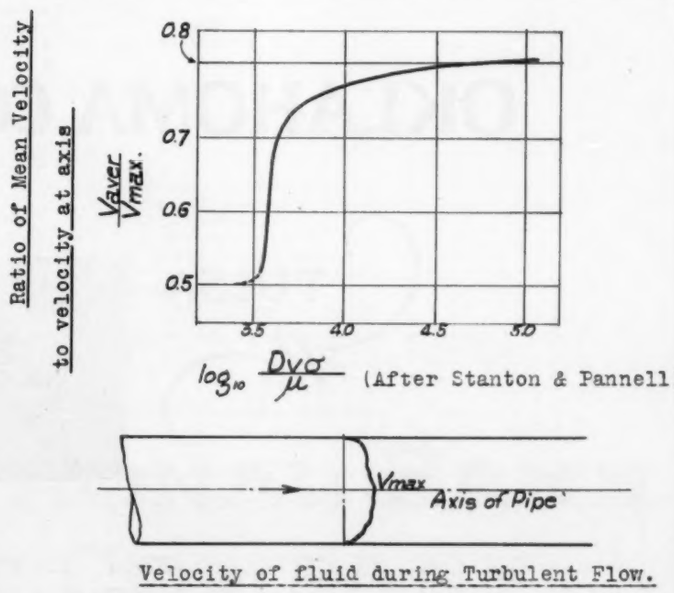
For the various sizes of commercial pipe this formula reduces to:

(See Diagram 2)

With the units employed in the formulas the critical velocity occurs when $R = \frac{Q}{dn} = 93$ i.e., for values R<93 the motion of the fluid will be stream-line in character, and for R>93 the flow will be turbulent. The formulas are valid for both conditions of flow.

It is interesting to note that the curve $f = \phi\left(\frac{Q}{dn}\right)$ tends to assume an outline parallel to the abscissa for high values

[1] See Durand, Hydraulics of Pipe Lines.



Velocity of fluid during Turbulent Flow.

(Diagram 1)

A Pipe Line Can Go Into Operation Only When the Last Joint Is Coupled or Welded

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of R. At high values of R the pressure varies nearly as the square of the discharge, f remaining practically constant.

It must be borne in mind that the coefficient f represents a degree of roughness usually met with in commercial steel pipe, and that for very rough pipe the values of f will be greater, especially in the turbulent region.

hour, if the characteristics of the oil are as follows:

Absolute viscosity $\mu = 1.78$
Specific gravity $s = 0.946$
Kinematic viscosity $n = 1.88$

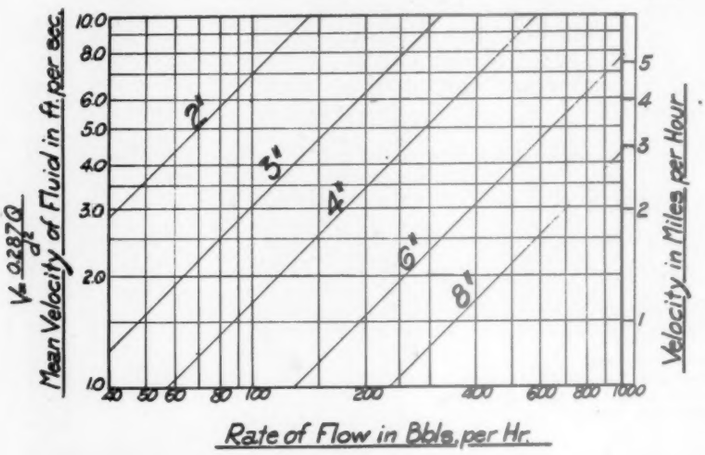
The Reynolds number

$$R = \frac{Q}{dn} = \frac{1{,}000}{7.98 \times 1.88} = 66.5$$

The mode of motion therefore comes

DIAMETER FUNCTIONS OF STEEL LINE PIPE

Nominal dia. (in.)	Weight per ft.	Actual dia. (in.)	Outside dia. (in.)	d^5	$d^{5/2}$	Cubic capacity per mile (bbls.)
2	3.716	2.067	2.375	37.73	6.14	21.91
3	7.675	3.068	3.50	271.82	16.5	48.25
4	10.980	4.026	4.50	1,057.70	32.5	83.14
6	19.367	6.065	6.625	8,206.4	90.6	188.79
8	29.213	7.981	8.625	32,381	180.0	326.79
10	41.644	10.02	10.750	101,000	318.0	515.0



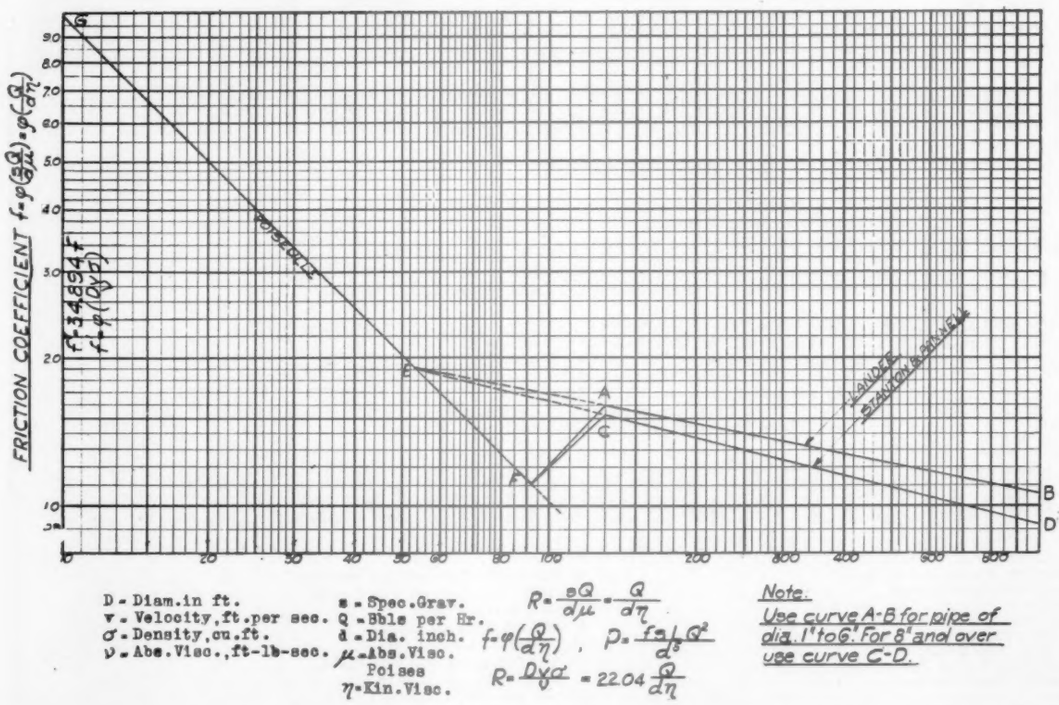
Nominal Diameter	Actual Diameter	Q	P	L
2"	2.067	$Q = \frac{6.14}{\sqrt{f_0}}\sqrt{\frac{P}{L}}$	$P = \frac{f_0 L Q^2}{37.73}$	$L = \frac{37.73 P}{f_0 Q^2}$
3"	3.068	$Q = \frac{16.5}{\sqrt{f_0}}\sqrt{\frac{P}{L}}$	$P = \frac{f_0 L Q^2}{271.8}$	$L = \frac{271.8 P}{f_0 Q^2}$
4"	4.026	$Q = \frac{32.5}{\sqrt{f_0}}\sqrt{\frac{P}{L}}$	$P = \frac{f_0 L Q^2}{1057.7}$	$L = \frac{1057.7 P}{f_0 Q^2}$
6"	6.065	$Q = \frac{90.6}{\sqrt{f_0}}\sqrt{\frac{P}{L}}$	$P = \frac{f_0 L Q^2}{8206.4}$	$L = \frac{8206.4 P}{f_0 Q^2}$
8"	7.981	$Q = \frac{180}{\sqrt{f_0}}\sqrt{\frac{P}{L}}$	$P = \frac{f_0 L Q^2}{32381}$	$L = \frac{32381 P}{f_0 Q^2}$
10"	10.02	$Q = \frac{318}{\sqrt{f_0}}\sqrt{\frac{P}{L}}$	$P = \frac{f_0 L Q^2}{101000}$	$L = \frac{101000 P}{f_0 Q^2}$

(Diagram 2)

will, however, show a graphical method in later section which permits a solution of the problem from P toward Q.

Equivalent Lines

It is often convenient to convert a system of lines into a single equivalent line. This equivalent line is so chosen that it offers the same resistance as the original combination, when the rate of flow is the same. In this manner many problems can be simplified by converting the actual system of lines, which may not yield to direct mathematical treatment in its original form, into a simplified equivalent system easily susceptible to mathematical analysis.



D = Diam. in ft.
v = Velocity, ft. per sec.
σ = Density, cu. ft.
ν = Abs. Visc., ft-lb-sec.
s = Spec. Grav.
Q = Bbls per Hr.
d = Dia. inch.
μ = Abs. Visc. Poises
η = Kin. Visc.

$R = \frac{sQ}{d\mu} = \frac{Q}{d\eta}$, $f = \varphi\left(\frac{Q}{d\eta}\right)$, $P = \frac{fsLQ^2}{d^5}$, $R = \frac{Dv\sigma}{\nu} = 22.04\frac{Q}{d\eta}$

Note.
Use curve A-B for pipe of dia. 1" to 6". For 8" and over use curve C-D.

From the curve in the diagram it is seen that there is a sharp increase in the value of the friction factor f at the point of change from stream line flow to turbulence. This entire transitional period is one of uncertainty which needs further examination. It is therefore recommended that for values of R falling into this region, the friction factors be read from the dotted lines extending the line of turbulence to point E. Any error thus made in case of pipe line design will be on the side of safety.

Problem

What is the pressure drop in 12 miles of 8-inch pipe at Q = 1,000 bbls. per

within the critical region. Taking the lower value for f = 1.52, we obtain

$$P = \frac{fsLQ^2}{d^5} = \frac{1.52 \times 0.946 \times 12 \times 1{,}000^2}{32{,}381} = 533 \text{ pounds.}$$

This result corresponds to the curve as established by Stanton and Pannell. In case of design, however, it will be advisable to use the dotted curve for f, in this case f = 1.81, and P = 635 pounds, which would allow for the uncertainty in this region.

It will be noticed that his problem can be solved directly in one direction only, i.e., from Q toward the pressure. We

From $P = \frac{fsLQ^2}{d^5}$

we can easily determine the various pipe equivalents, i.e., the length of different size pipes giving equal total pressure drop at equal rates of flow.

$$P = \frac{f_1 s L_1 Q^2}{d_1^5} = \frac{f_2 s L_2 Q^2}{d_2^5}$$

$\frac{L_1}{L_2} = \frac{f_2 d_1^5}{f_1 d_2^5}$, and if we assume L = 1 mile

$$L_2 = \frac{f_1 d_2^5}{f_2 d_1^5}$$

i.e., 1 mile of line d_1 offers the same resistance to flow as $L_2 = \frac{f_1 d_2^5}{f_2 d_1^5}$ miles of line d_2. We see therefore that the pipe line equivalents are dependent on

$f = \phi\left(\frac{Q}{dn}\right)$.

Arranged in a table these values are:

(See Diagram 3)

It is easily seen that the equation for Q of a line system consisting of n lines of diameters $d_1, d_2 \ldots d_n$, and all being of the same length may be written

(See Diagram 4)

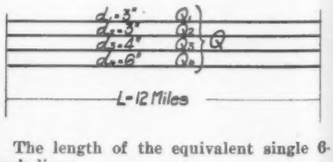
and the length E of the equivalent line is

$$E = \frac{L\, d^5 eg}{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}} + \ldots \frac{d_n^{5/2}}{\sqrt{f_n}}\right)^2}$$

It is to be noted especially that this formula only holds when the total pressure drop is the same in every one of the component lines of the system, i.e., when they are connected together at the end of distance L.

Problem

Let it be required that the following system, consisting of four lines, be reduced to a single 6-inch equivalent. Q = 500 bbls. per hour. (Let $\mu = 0.14$, $s = 0.84$.)



The length of the equivalent single 6-inch line:

$$E = \frac{L\, d^5 eg}{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}} + \frac{d_2^{5/2}}{\sqrt{f_2}} + \frac{d_3^{5/2}}{\sqrt{f_3}} + \frac{d_4^{5/2}}{\sqrt{f_4}}\right)^2}$$

and it is at once evident that the amounts flowing through each component line must be known if the equation is to be solved.

This is best done by successive approximation. Taking the formula $Q = \left(\frac{d_1^{5/2}}{\sqrt{f_1}} + \frac{d_2^{5/2}}{\sqrt{f_2}} + \frac{d_3^{5/2}}{\sqrt{f_3}} + \frac{d_4^{5/2}}{\sqrt{f_4}}\right)\sqrt{\frac{P}{sL}}$ we get the first approximation by disregarding the denominators within the bracket,

To increase gas line efficiency ...*specify*

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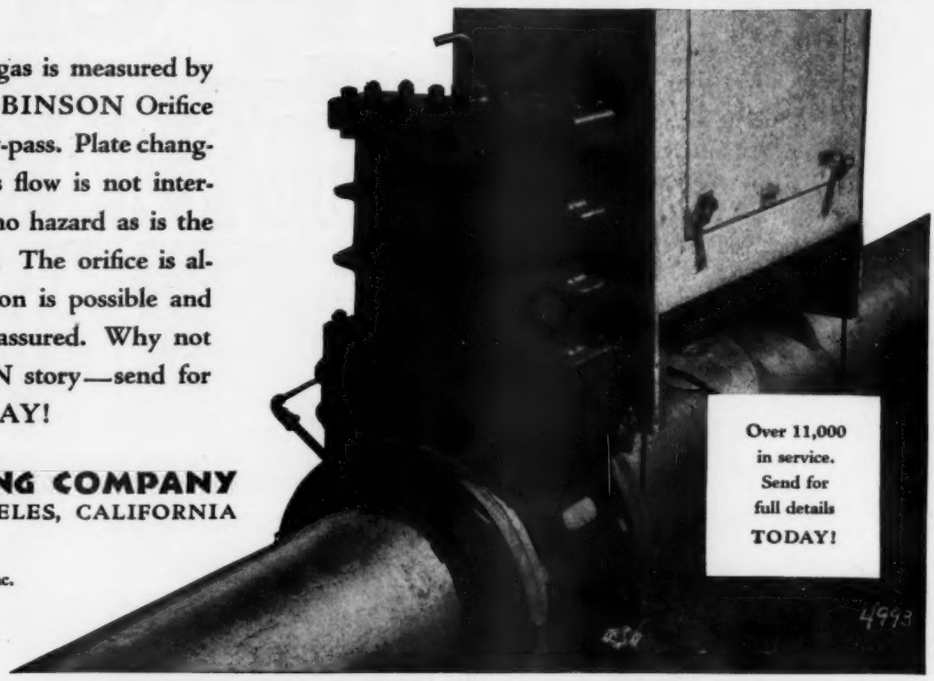

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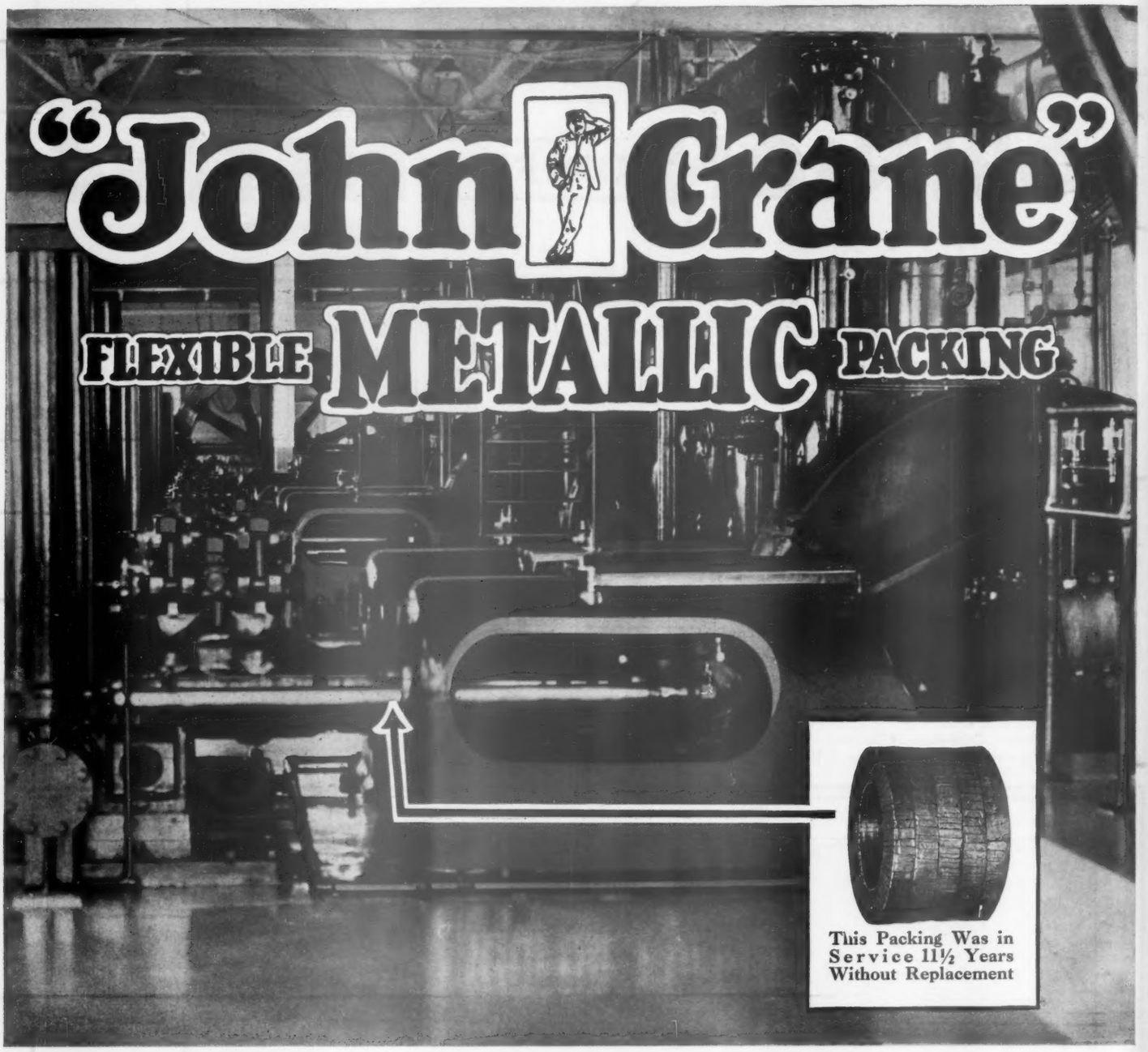

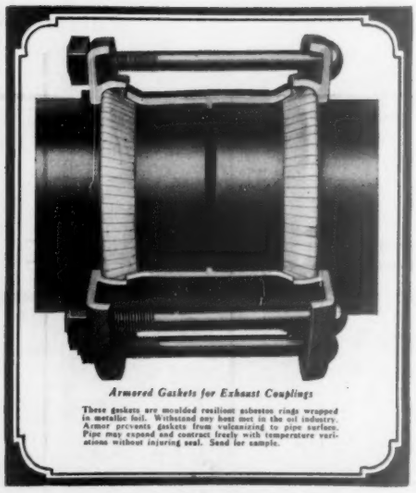

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For Pipe Line Station Plunger Pumps

In the West Dallas Station of the Texas Pipe Line Company, illustrated above, one set of "John Crane" Metallic Packing was in service working under 700 lbs. pressure constantly from June 15, 1917, to December 1, 1928. When the equipment was replaced and put on the emergency service list, the packing was still intact with the plungers highly polished. The new pumps in the foreground are, of course, packed the same way.

There are many such instances among the pumping stations of remarkable service from "John Crane" Metallic Packing. There is practically no abrasion—no friction—the babbitt sealing face remains intact. The fabric channels provide ample resilience. For equal results order "John Crane" Metallic.

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For Small Centrifugal Gasoline Pumps

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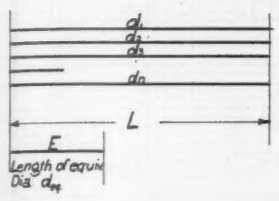
A Packing for EVERY SERVICE in the Oil Industry

2"	3"	4"	6"	8"
1	$\frac{f_2'}{f_3'}\times 7.22$	$\frac{f_2'}{f_4'}\times 27.9$	$\frac{f_2'}{f_6'}\times 216$	$\frac{f_2'}{f_8'}\times 855$
	1	$\frac{f_3'}{f_4'}\times 3.88$	$\frac{f_3'}{f_6'}\times 30.1$	$\frac{f_3'}{f_8'}\times 119$
		1	$\frac{f_4'}{f_6'}\times 7.73$	$\frac{f_4'}{f_8'}\times 30.6$
			1	$\frac{f_6'}{f_8'}\times 3.95$

(Diagram 3)



$$Q=\left(\frac{d_1^{\frac{5}{2}}}{\sqrt{f_1}}+\frac{d_2^{\frac{5}{2}}}{\sqrt{f_2}}+\cdots\frac{d_n^{\frac{5}{2}}}{\sqrt{f_n}}\right)\sqrt{\frac{P}{aL}},$$

Hence:-

$$P=\frac{aLQ^2}{\left(\frac{d_1^{\frac{5}{2}}}{\sqrt{f_1}}+\cdots\frac{d_n^{\frac{5}{2}}}{\sqrt{f_n}}\right)^2}=\frac{f_{eq}\,a\,L\,Q^2}{d_{eq}^5}$$

(Diagram 4)

and the stream Q may be regarded as being divided in the ratio

$Q_1 : Q_2 : Q_3 : Q_4 = d_1^{5/2} : d_2^{5/2} : d_3^{5/2} : d_4^{5/2}$

In the present problem:

$d_1^{5/2}$ =	16.5
$d_2^{5/2}$ =	16.5
$d_3^{5/2}$ =	32.5
$d_4^{5/2}$ =	90.6
	156.1

and

First Approximation

$Q_1 = \frac{500\times 16.5}{156.1}$ =	52.95	Bbls.
$Q_2 = \frac{500\times 16.5}{156.1}$ =	52.95	"
$Q_3 = \frac{500\times 32.5}{156.1}$ =	104.1	"
$Q_4 = \frac{500\times 90.6}{156.1}$ =	290.0	"
	500.0	Bbls.

Using these values we get

$Q_1=52.95$	$R_1=\frac{sQ}{d\mu}=\frac{0.84\times 52.95}{3.07\times 0.14}$ = 103.6	f_1 = 1.25	$\sqrt{f_1}$ = 1.12	
$Q_2=52.95$	$R_2=\frac{0.84\times 52.95}{3.07\times 0.14}$ = 103.6	f_2 = 1.25	$\sqrt{f_2}$ = 1.12	
$Q_3=104.1$	$R_3=\frac{0.84\times 104.1}{4.68\times 0.14}$ = 155.0	f_3 = 1.54	$\sqrt{f_3}$ = 1.24	
$Q_4=290.0$	$R_4=\frac{0.84\times 290.0}{6.07\times 0.14}$ = 286.0	f_4 = 1.37	$\sqrt{f_4}$ = 1.17	

New F-A-B, Fig.

With these results at hand we can now write:

$Q_1 : Q_2 : Q_3 : Q_4 =$

$$\frac{d_1^{5/2}}{\sqrt{f_1}} : \frac{d_2^{5/2}}{\sqrt{f_2}} : \frac{d_3^{5/2}}{\sqrt{f_3}} : \frac{d_4^{5/2}}{\sqrt{f_4}}$$

$$\frac{d_1^{5/2}}{\sqrt{f_1}}=\frac{16.5}{1.12}=14.7$$

$$\frac{d_2^{5/2}}{\sqrt{f_2}}=\frac{16.5}{1.12}=14.7$$

$$\frac{d_3^{5/2}}{\sqrt{f_3}}=\frac{32.5}{1.24}=26.2$$

$$\frac{d_4^{5/2}}{\sqrt{f_4}}=\frac{90.6}{1.17}=77.4$$

133.0

Hence

Second Approximation

$Q_1 = \frac{500\times 14.7}{133.0}$	= 55.3	Bbls.	
$Q_2 = \frac{500\times 14.7}{133.0}$	= 55.3	"	
$Q_3 = \frac{500\times 26.2}{133.0}$	= 98.6	"	
$Q_4 = \frac{500\times 77.4}{133.0}$	= 291.0	"	
Q	= 500.2	Bbls.	

The problem stipulates that the system be converted into equivalent single 6-inch, hence we have to determine feg at Q = 500 bbls.

$$R=\left(\frac{sQ}{d\mu}\right)=\frac{0.84\times 500}{6.07\times 0.14}=494, \text{ and}$$

feg = 1.22

Substituting all the values thus obtained in the equation:

$$E=\frac{L\,d^5eg}{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}}+\cdots\frac{d_4^{5/2}}{\sqrt{f_4}}\right)^2}$$

$$=\frac{12\times 8206.4}{1.22(14.7+14.7+26.2+77.4)^2}$$

$$=\frac{12\times 8206.4}{1.22\times 17689}$$

E=4.56 miles of single 6-inch at Q=500.

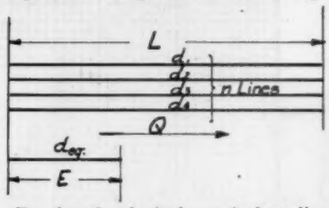
From the reduction formula we see that the length of the equivalent line is a function of the rate of flow, and that the result just obtained is true for this system of lines only when Q = 500 bbls. per hour. The following diagram shows the curve expressing the function between length of equivalent line and the rate of flow through the system. It is noticed that in the turbulent region, due to the slight variation of f, the value of E has a tendency to become constant. On the other hand in the region for Q< 300 bbls. we see a very marked increase in the value of E with decreasing rate of flow Q.

It is especially important to bear this in mind for lines handling very viscous oils which have to be heated. Such lines operate in most instances under conditions of stream-line flow, where the variation of Q, and consequently f, is very marked.

The solid curve in the diagram is based on the theoretical curve BAFG in the diagram — and should be used when checking the performance of an existing line system. If the computations are made for the design of a pipe line system of specified capacity, it is advisable to use the dotted portion B A E of the curve. Any error thus made will be on the side of safety. This is reflected in the dotted portion of curve in the diagram.

(See Diagram 5)

Reduction of System of Parallel Lines, All of Equal Diameter, Into Single Equivalent Length of Diameter deg.



For length of single equivalent line, we have the equation:

$$E=\frac{L\,d^5eg}{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}}+\cdots\frac{d_n^{5/2}}{\sqrt{f_n}}\right)^2}$$

The diameter is the same in all component lines, hence the rate of flow in each one $\frac{Q}{n}$, with a corresponding friction factor f. The equation reduces therefore to:

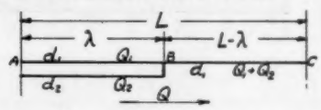
$$E=\frac{Ld^5}{feg\left(n\frac{d^{5/2}}{\sqrt{f}}\right)^2}=\frac{L}{\frac{feg}{n^2f}}=\frac{L}{K}$$

$K=\frac{n^2feg}{f}$ — Rate of flow Q in deg.

$\frac{Q}{n}$ — Rate of flow.

Reduction of a Looped Line Into Single Equivalent

A line system of the form shown in the diagram is spoken of as a "looped" line.



This reduction may be accomplished as follows:

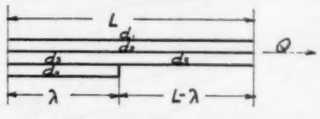
Let E′ = single equivalent line of diameter deg. (Sect. A—B)

Let E″ = single equivalent line of diameter deg. (Sect. B—C)

Then E = E′+E″

$$E=\frac{\lambda\,d^5eg}{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}}+\frac{d_2^{5/2}}{\sqrt{f_2}}\right)^2}+\frac{f_1\,d^5eg}{feg\,d_1^5}(L-\lambda)$$

Reduction of a Line System Where One or More of the Component Lines Are Looped. Loops Not Connected Into All of the Lines

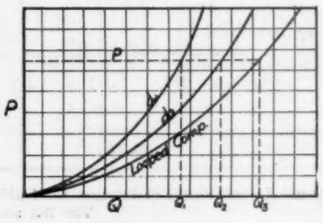


If the friction head P producing the rate of flow Q through the system is known, the problem resolves itself into the simple proposition of determining

$$E=\frac{d^5eg\,P}{feg\,SQ^2}$$

in which E is the length of the equivalent line.

If P is not given, compute enough values of the curve P-Q for each component line and plot the graphs on co-ordinate paper.



By trial we find the value of P which satisfies the condition

$$Q_1+Q_2+Q_3 = Q$$

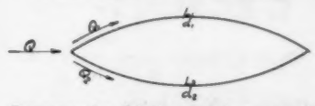
Insert the value for P thus found in equation for E given above.

The numerical problem given in the preceding section could have been solved in the same manner.

It must not be forgotten that the value for E holds only for the condition that the rate of flow in the system be Q. To solve the problem fully it is necessary to determine E for a sufficient number of values of Q within the required range so as to enable the drawing of a curve similar to the one in the preceding section.

When using the value of E, as for instance in a looping formula such as given in a later section, care must be taken that the E corresponding to the proper rate of flow Q is chosen.

Reduction of System Where Component Lines Are of Unequal Lengths



Prepare the friction head curves for component lines as shown in previous section. Determine P which makes

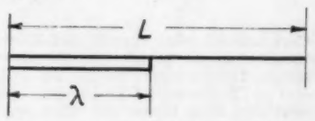
$Q_1+Q_2 = Q$ and insert in

$$E=\frac{d^5eg\,P}{feg\,SQ^2}$$

Repeat for the required number of values of Q and plot as shown before.

Loops and Looping Factors

A line system of the arrangement shown in the diagram is spoken of as a looped line.



In many instances, when a line system is to be designed for a definite capacity, such a looped system is the result. We will now develop a general formula for the amount of loop necessary to give any line or system of lines a definite increase in capacity. In the case of a single line, and when the loop is of the same diameter as the original line, the maximum increase is reached when the loop extends the entire way, and the original capacity is doubled.

The formula developed in the following is valid for all conditions, and it is not necessary that the original line and the loop be of the same diameter. It may be well, however, to point out, that looping will be most economical when the difference in diameter between the original line and the loop is as small as possible; in other words, it would not pay to loop, say, an 8-inch line with a 2-inch, etc.

Let us assume now that:

L = Length of original system in miles.

λ = Length of required loop in miles.

K_1 = Factor for changing unlooped line into equivalent.

K_2 = Factor for changing looped section into equivalent deg.

E_1 = Length of equiv, line deg., before looping, capacity.

E_2 = Length of equiv. line deg., after looping, capacity.

Q_1 = Capacity of original system.

Q_2 = Capacity of looped system, at same pressure drop as that assumed for Q_1.

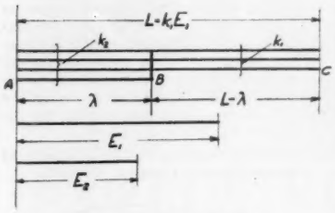
Changing a line system into an equivalent single line of diameter deg., we have

$$E=\frac{L\,d^5eg}{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}}+\cdots\frac{d_n^{5/2}}{\sqrt{f_n}}\right)^2}=\frac{L}{\frac{feg\left(\frac{d_1^{5/2}}{\sqrt{f_1}}+\cdots\frac{d_n^{5/2}}{\sqrt{f_n}}\right)^2}{d^5eg}}=\frac{L}{K}$$

$$K = \frac{\text{leg}\left(\frac{d_1^{5/2}}{\sqrt{f_1}} + \ldots \frac{d_n^{5/2}}{\sqrt{f_n}}\right)^2}{d^5 \text{eg}}$$

Now let it be required that a line system of capacity Q_1 be looped so as to increase its capacity to Q_2.

From above $E = \frac{L}{K}$



We then obtain: $\frac{\lambda}{K_2} + \frac{L-\lambda}{K_1} = E_2$

But $L = K_1 E_1$, hence

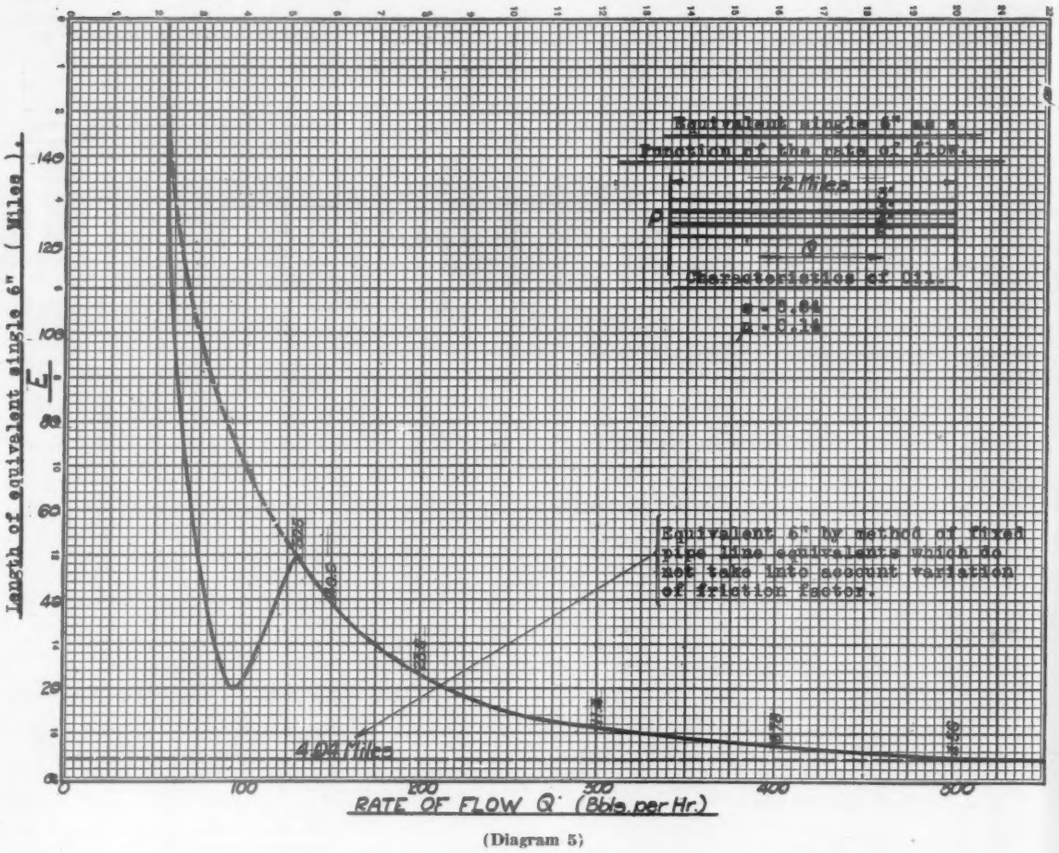
$$\frac{\lambda}{K_2} + \frac{K_1 E_1 - \lambda}{K_1} = E_2$$

$$\frac{K_1\lambda + K_1 K_2 E_1 - K_2\lambda}{K_1 K_2} = E_2$$

$\lambda(K_1-K_2) = K_1K_2(E_2-E_1)$ multiplying by -1,

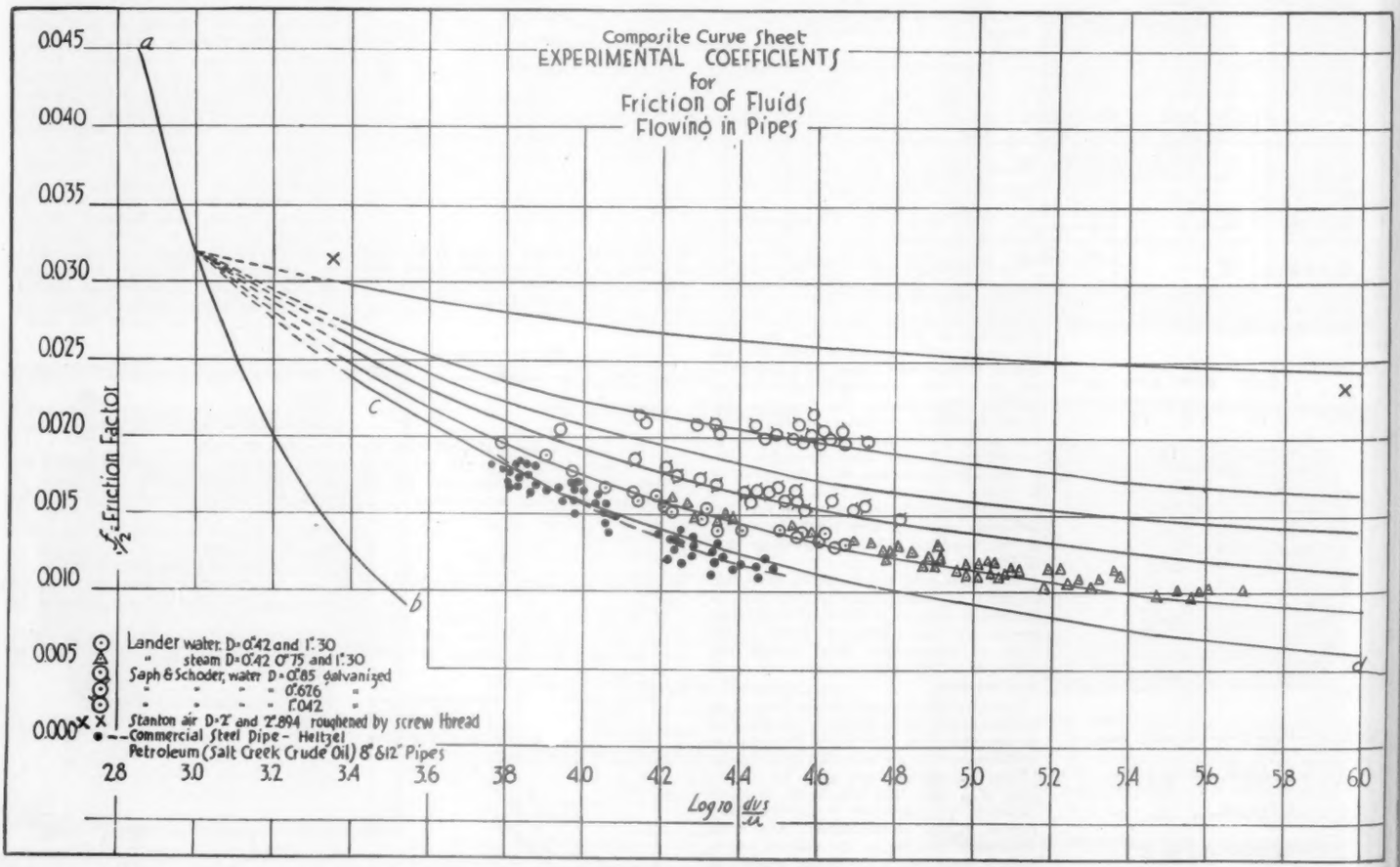
$$\lambda = \frac{K_1K_2}{K_1-K_2}(E_1-E_2)$$

Care must be taken that K_1 and K_2 are determined in the proper way, for these reduction factors carry the friction coefficient f. The rate of flow in each component line, both before and after looping, must be determined in the manner explained before in order to get the proper friction coefficients in the equation for K.


Length of equivalent single 6" (Miles) E
Equivalent single 6" as a function of the rate of flow
12 Miles
Characteristics of Oil
Equivalent 6" by method of Fanning pipe line equivalents which do not take into account variation of friction factor.
4.02 Miles
RATE OF FLOW Q (Bbls. per Hr.)
100
200
300
400
500

(Diagram 5)

Problem—A system of two 4-inch lines 16 miles long has a capacity of 300 bbls. per hour. Specific gravity of oil = 0.833, and the kinematic viscosity n = 0.141. How far will this system have to be looped if its capacity is to be increased to 400 bbls. per hour without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" steam D=0.42 0.75 and 1.30
Saph & Schoder, water D=0.85 galvanized
" " " = 0.676 "
" " " = 1.042 "
Stanton air D=2" and 2.894 roughened by screw thread
Commercial Steel Pipe - Heltzel
Petroleum (Salt Creek Crude Oil) 8" & 12" Pipes

Figure 2—Composite curve sheet for experimental coefficients of friction for fluids flowing in pipes. The curve "c-d" is the Stanton and Pannell curve. (After Heltzel, The Oil and Gas Journal.)

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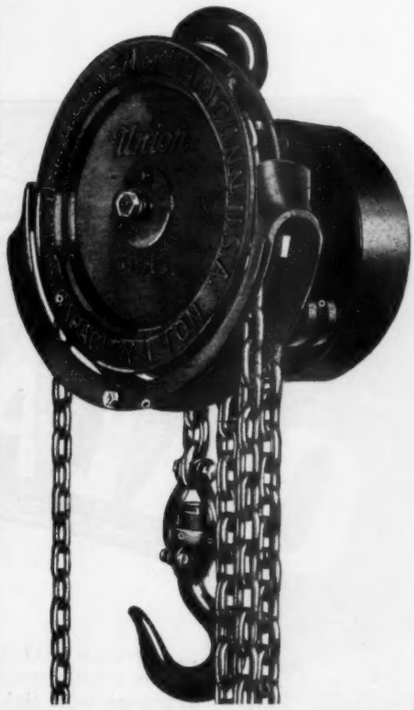

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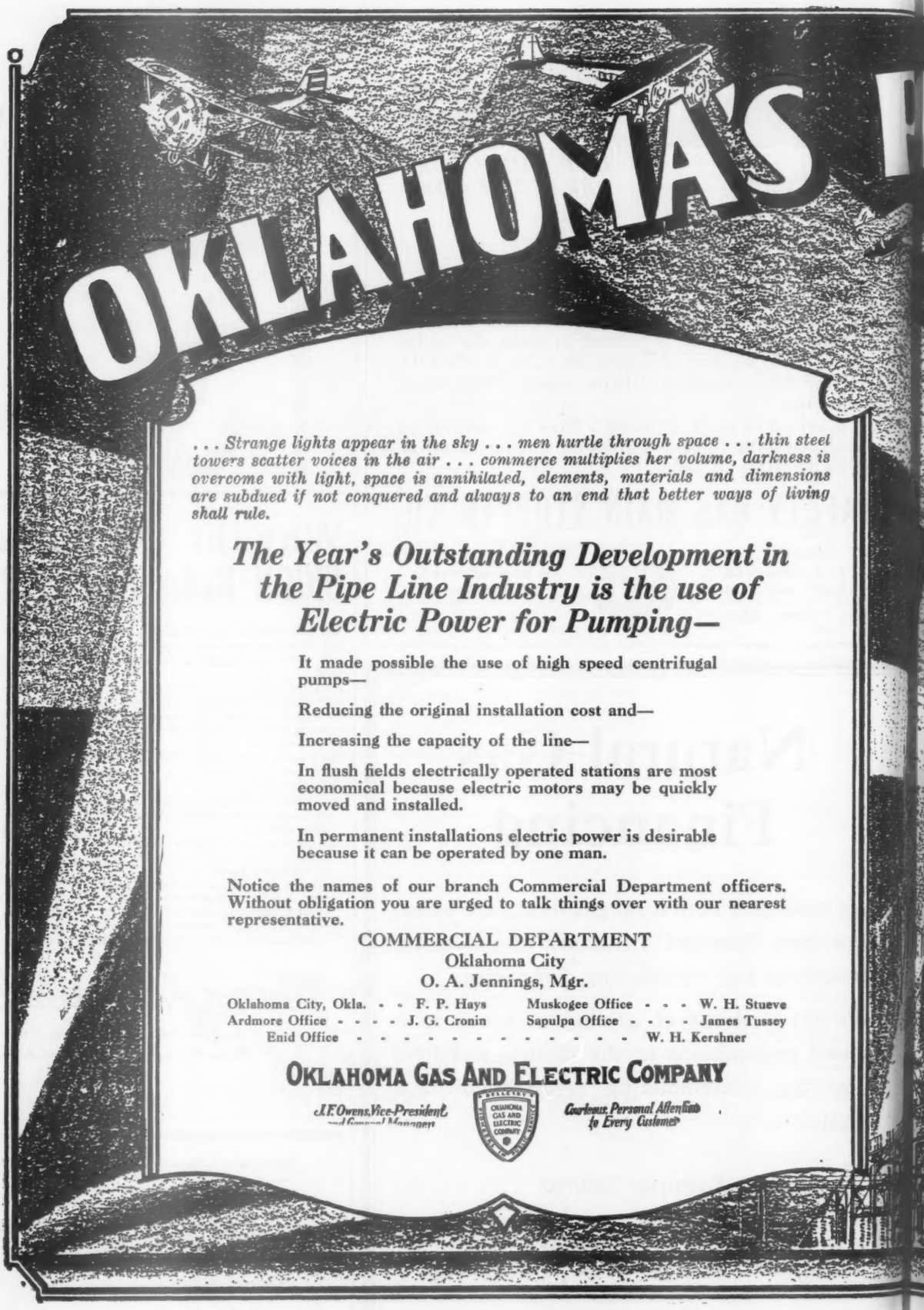

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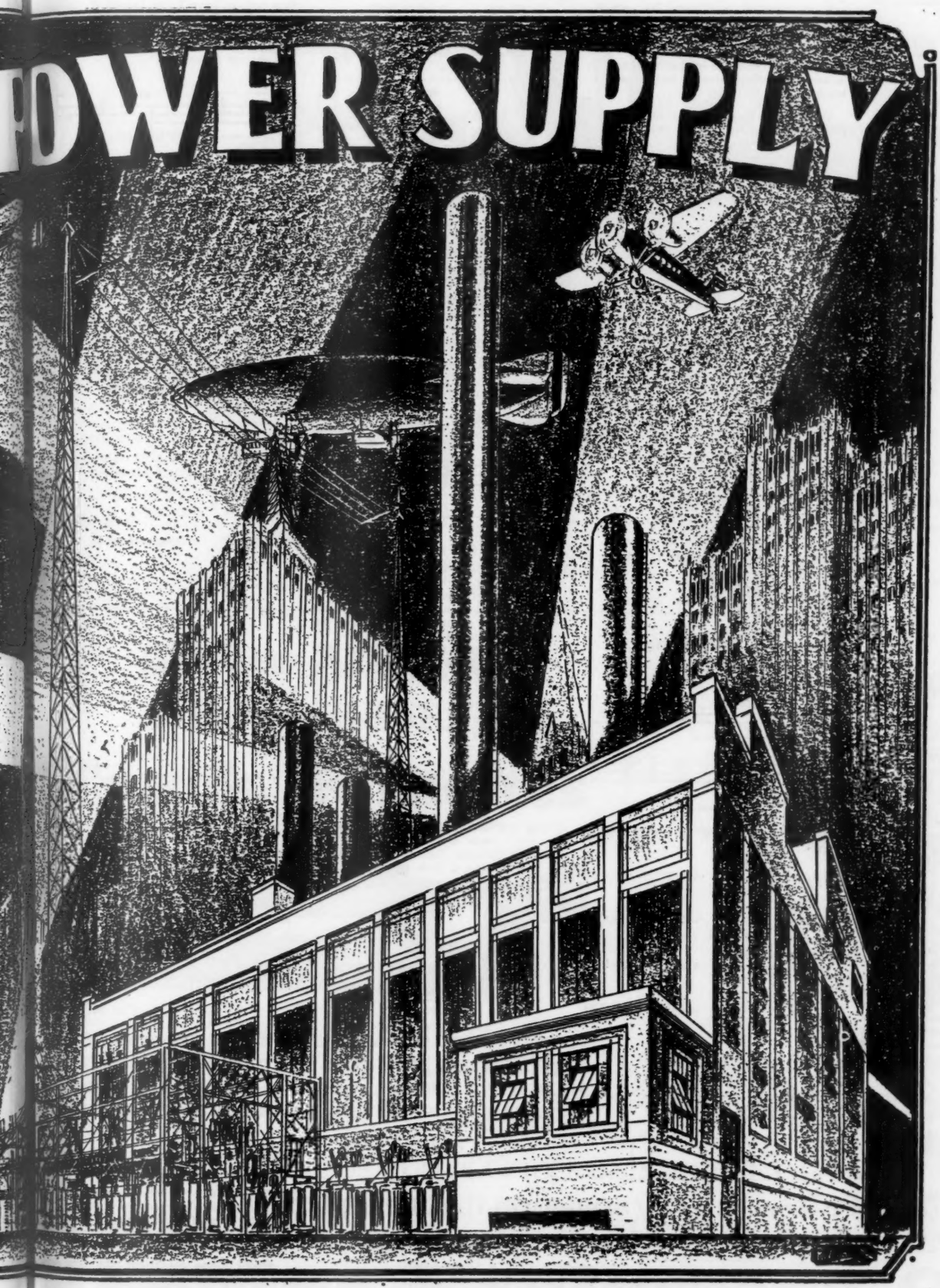
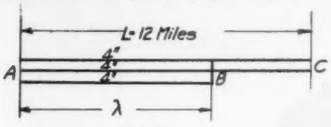

POWER SUPPLY

increase of the pumping pressure at A?



$$\lambda = \frac{K_1K_2}{K_1-K_2}(E_1-E_2)$$

$$K = \frac{feg\left(\frac{d_3^{5/2}}{\sqrt{f_1}}+\frac{d_2^{5/2}}{\sqrt{f_2}}\right)^2}{d^5eg}$$

K_1 for unlooped line at flow $Q_1 = 300$ bbls. Since $d_1 = d_2$

$$K_1 = \frac{f'eg + 4\frac{d^5}{f_1}}{d^5eg} = \frac{4f'eg}{f_1}, \text{ in}$$

which f'eg = friction coefficient for equivalent at flow $Q_1 = 1.21$. f_1 = friction coefficient for component 4-inch at flow $\frac{Q_1}{2} = 1.39$.

Then:

$$K_1 = \frac{4\times1.21}{1.39} = 3.48, \text{ and}$$

$$E_1 = \frac{L}{K_1} = \frac{16}{3.48} = 4.59 \text{ miles.}$$

K_2 is the factor for changing the looped section A-B into single equiv. 4-inch at flow Q_2.

f"eg = frict. coeff. for equiv. 4-inch at flow $Q_2 = 1.14$.

f_2 = frict. coeff. for component 4-inch at flow $\frac{Q_2}{3} = 1.42$.

Here the expression for K reduces to:

$$K_2 = \frac{f''eg\times9\frac{d^5}{f_2}}{deg^5} = \frac{9f''eg}{f_2} = \frac{9\times1.14}{1.42} = 7.23.$$

From:

$$P = \frac{f'eg\,sE_1Q_1^2}{d^5} = \frac{f''eg\,sE_2Q_2^2}{d^5}$$

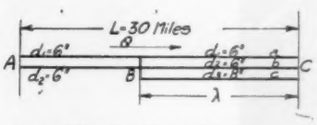
$$E_2 = \frac{f'eg\,E_1Q_1^2}{f''eg\,Q_2^2} = \frac{1.21\times4.59\times300\times300}{1.14\times400\times400} = 2.73$$

Inserting all the values thus determined in the equation for λ:

$$\lambda = \frac{K_1K_2}{K_2-K_1}(E_1-E_2) = \frac{3.48\times7.23}{7.23-3.48}(4.59-2.73)$$

= 12.49 miles of 4-inch loop.

Problem—A parallel line system consisting of two 6-inch lines, 30 miles long, has a capacity of 800 bbls. per hour (704 pounds). The capacity of this system is to be increased to 25,000 bbls. per day = 1,040 bbls. per hour, by looping with 8-inch. How far does the loop have to extend, if the kinematic viscosity of the oil n = 0.27 and S = 0.86? Line is level.



Q_1 = 800 bbls (before looping).

Q_2 = 1,040 bbls. (after looping at same pressure).

Convert into single equivalent 8-inch.

Note—Use curve C-D for 8-inch.

Let—

f'eg = Friction coefficient for equivalent 8-inch, $Q = Q_1$ (800 bbls.).

f_1 = Friction coefficient for one 6-inch, $Q = \frac{Q_1}{2}$ (400 bbls.).

f"eg = Friction coefficient for equivalent 8-inch, $Q = Q_2$ (1,040 bbls.).

f_2 = Friction coefficient for one 6-inch, $Q = \frac{Q_2}{2}$ (520 bbls.).

f_3 = Friction coefficient for one 6-inch section B-C (250 bbls.).

f_4 = Friction coefficient for one 8-inch section B-C (540 bbls.).

The first step consists in finding the flow in each component line of looped section when Q = 1,040 bbls.

Using as first approximation the proportion $d_a^{5/2} : d_b^{5/2} : d_c^{5/2}$ we obtain

$$Q_a = \frac{1040\times90.6}{361.2} = 261.0 \qquad d_a^{5/2} = 90.6$$

$$Q_b = \frac{1040\times90.6}{361.2} = 261.0 \qquad d_b^{5/2} = 90.6$$

$$Q_c = \frac{1040\times180}{361.2} = 518.0 \qquad d_c^{5/2} = 180.0$$

1040.0 361.2

(Section B-C)

261	$R = \frac{261}{6.07\times0.27} = 159$	$f_a = 1.54$ $\sqrt{f_a} = 1.24$
261	$R = \frac{261}{6.07\times0.27} = 159$	$f_b = 1.54$ $\sqrt{f_b} = 1.24$
518	$R = \frac{518}{7.98\times0.27} = 240$	$f_c = 1.30$ $\sqrt{f_c} = 1.14$

$$\frac{d_a^{5/2}}{\sqrt{f_2}} = \frac{90.6}{1.24} = 73.0$$

$$\frac{d_b^{5/2}}{\sqrt{f_3}} = \frac{90.6}{1.24} = 73.0$$

$$\frac{d_c^{5/2}}{\sqrt{f_4}} = \frac{180.0}{1.14} = 158.0, \text{ then}$$

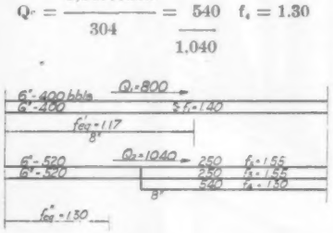
$Q_a : Q_b : Q_c = 73.0 : 73.0 : 158.0$, and

$$Q_a = \frac{1,040\times73}{304} = 250 \qquad f_2 = 1.55$$

$$Q_b = \frac{1,040\times73}{304} = 250 \qquad f_3 = 1.55$$

$$Q_c = \frac{1,040\times158}{304} = 540 \qquad f_4 = 1.30$$

1,040



Proceeding similarly to get the other friction coefficients:

f'eg $R = \frac{800}{7.98\times0.27} = 372$ f'eg = 1.17

f_1 $R = \frac{400}{6.07\times0.27} = 244$ f_1 = 1.40

f"eg $R = \frac{1,040}{7.98\times0.27} = 483$ f"eg = 1.10

f_2 $R = \frac{520}{6.07\times0.27} = 317$ f_2 = 1.34

f_3 $R = \frac{250}{6.07\times0.27} = 152$ f_3 = 1.55

f_4 $R = \frac{540}{7.98\times0.27} = 251$ f_4 = 1.30

From

$$K = \frac{feg\left(\frac{d_3^{5/2}}{\sqrt{f_1}}+\dots+\frac{d_n^{5/2}}{\sqrt{f_n}}\right)^2}{d^5eg}$$

we get for

$$K_1 = \frac{f'eg\left(\frac{d_3^{5/2}}{\sqrt{f_1}}+\frac{d_2^{5/2}}{\sqrt{f_1}}\right)^2}{d^5eg}$$

$$= \frac{1.17\left(\frac{90.5}{1.184}+\frac{90.5}{1.184}\right)^2}{32,381}$$

$K_1 = 0.843$

$$E_1 = \frac{L}{k_1} = \frac{30}{0.843} = 35.6, \text{ and}$$

$$E_2 = \frac{f'egE_1Q_1^2}{f''egQ_2^2} = \frac{1.17\times35.6\times800^2}{1.10\times1,040^2} = 22.4$$

We also find

$$K_2 = \frac{f''eg\left(\frac{d_3^{5/2}}{\sqrt{f_2}}+\frac{d_2^{5/2}}{\sqrt{f_3}}+\frac{d_2^{5/2}}{\sqrt{f_4}}\right)^2}{d^5eg}$$

(Looped Section Q_2)

$$= \frac{1.10\left(\frac{90.5}{1.247}+\frac{90.5}{1.247}+\frac{180.0}{1.14}\right)^2}{32,381}$$

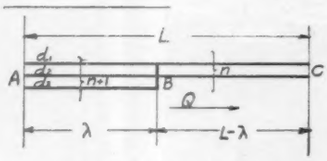
$K_2 = 3.12$

$$\lambda = \frac{k_1k_2}{k_2-k_1}(E_1-E_2) = \frac{0.843\times3.12}{2.277}(35.6-22.4) = \frac{0.843\times3.12\times13.2}{2.277}$$

λ = 15.22 miles of 8-inch loop.

Special Looping Formula

All component lines of original system and loop are of equal diameter.



$d_1 = d_2 = d_3 = \dots$ deg

Let E_1 = Equiv. single line before looping, at capacity Q_1. Friction coefficient f'eg.

E_2 = Equiv. single line after looping, at capacity Q_2. Friction coefficient f"eg.

f_1 = Friction factor for each component line at rate of flow $\frac{Q_1}{n}$.

f_2 = Friction factor for each component line at rate of flow $\frac{Q_2}{n+1}$.

f_3 = Friction factor for each component line at rate of flow $\frac{Q_2}{n}$.

f'eg = Friction factor for equiv. at rate of flow Q_1.

f"eg = Friction factor for equiv. at rate of flow Q_2.

Then, according to the equation, we get for

$$E_1 = \frac{L}{\frac{f'eg}{n^2\frac{}{f_1}}}, \text{ and}$$

$$E_2 = \frac{\lambda}{(n+1)^2\frac{f''eg}{f_2}} + \frac{L-\lambda}{n^2\frac{f''eg}{f_3}}$$

Substituting the value for L in the last equation, we obtain

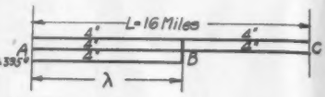
$$E_2 = \frac{\lambda}{(n+1)^2\frac{f''eg}{f_2}} + \frac{E_1n^2\frac{f'eg}{f_1}-\lambda}{n^2\frac{f''eg}{f_3}}$$

$$f''eg\,E_2 = \frac{\lambda f_2}{(n+1)^2} + \frac{\left(E_1n^2\frac{f'eg}{f_1}-\lambda\right)f_3}{n^2}$$

Solving for λ, this changes to

$$\lambda = \frac{n^2(n+1)^2}{f_2(2n+1)-n^2(f_2-f_3)} \times \left(\frac{f_2f'eg}{f_1}E_1 - f''eg\,E_2\right)$$

Problem—A system of two 4-inch lines, 16 miles long, has a capacity of 300 bbls. per hour (at a pressure of 395 pounds). Specific gravity of oil is S = 0.833, kinematic viscosity n = 0.141. How far will this system have to be looped if the capacity is to be increased to 400 bbls. per hour, without increase of the pumping pressure at A? It is assumed that the line system is level.



(Equivalent is 4-inch.) In this case:

$Q_1 = 300$ bbls. per hour.

$Q_2 = 400$ bbls. per hour.

$$f'eg = \phi\left(\frac{300}{4.03\times0.141}\right) = 1.21$$

$$f''eg = \phi\left(\frac{400}{4.03\times0.141}\right) = 1.14$$

$$f_1 = \phi\left(\frac{\frac{Q_1}{2}}{4.03\times0.141}\right) = \phi\left(\frac{150}{4.03\times0.141}\right) = \phi(263) = 1.39$$

$$f_2 = \phi\left(\frac{\frac{Q_2}{3}}{4.03\times0.141}\right) = \phi\left(\frac{133}{4.03\times0.141}\right) = \phi(233) = 1.42$$

$$f_3 = \phi\left(\frac{\frac{Q_2}{2}}{4.03\times0.141}\right) = \phi\left(\frac{200}{4.03\times0.141}\right) = \phi(351) = 1.31$$

$$E_1 = \frac{L}{\frac{f'eg}{n^2\frac{}{f}}} = \frac{16}{4\times\frac{1.21}{1.39}} = 4.59 \text{ miles.}$$

From

$$P = \frac{f'eg\,sE_1Q_1^2}{d^5} = \frac{f''eg\,sE_2Q_2^2}{d^5},$$

we get

$$E_2 = \frac{f'eg\,E_1Q_1^2}{f''eg\,Q_2^2} = \frac{1.21\times4.59\times300\times300}{1.14\times400\times400} = 2.73$$

Inserting these values in the formula for λ, we get

$$\lambda = \frac{n^2(n+1)^2}{f_2(2n+1)-n^2(f_2-f_3)} \times \left(\frac{f_2f'eg}{f_1}E_1 - f''eg\,E_2\right)$$

$$= \frac{4\times9}{1.31\times5-4\times0.11} \times \left(\frac{1.31\times1.21\times4.59}{1.39} - 1.14\times2.73\right)$$

= 5.9 (5.22 — 3.11)

λ = 12.45 miles of 4-inch loop.

Approximate Formulae for Equivalent Lines and Loops

For preliminary computations the formulae developed in the preceding sections may be simplified to a great degree by disregarding the variations in the friction coefficients.

Under these conditions the pipe line equivalents become:

2"	3"	4"	6"	8"
1.00	7.22	27.90	216.0	855.0
	1.00	3.88	30.1	119.0
		1.00	7.73	30.6
			1.0	3.96

and the expression for equivalent length

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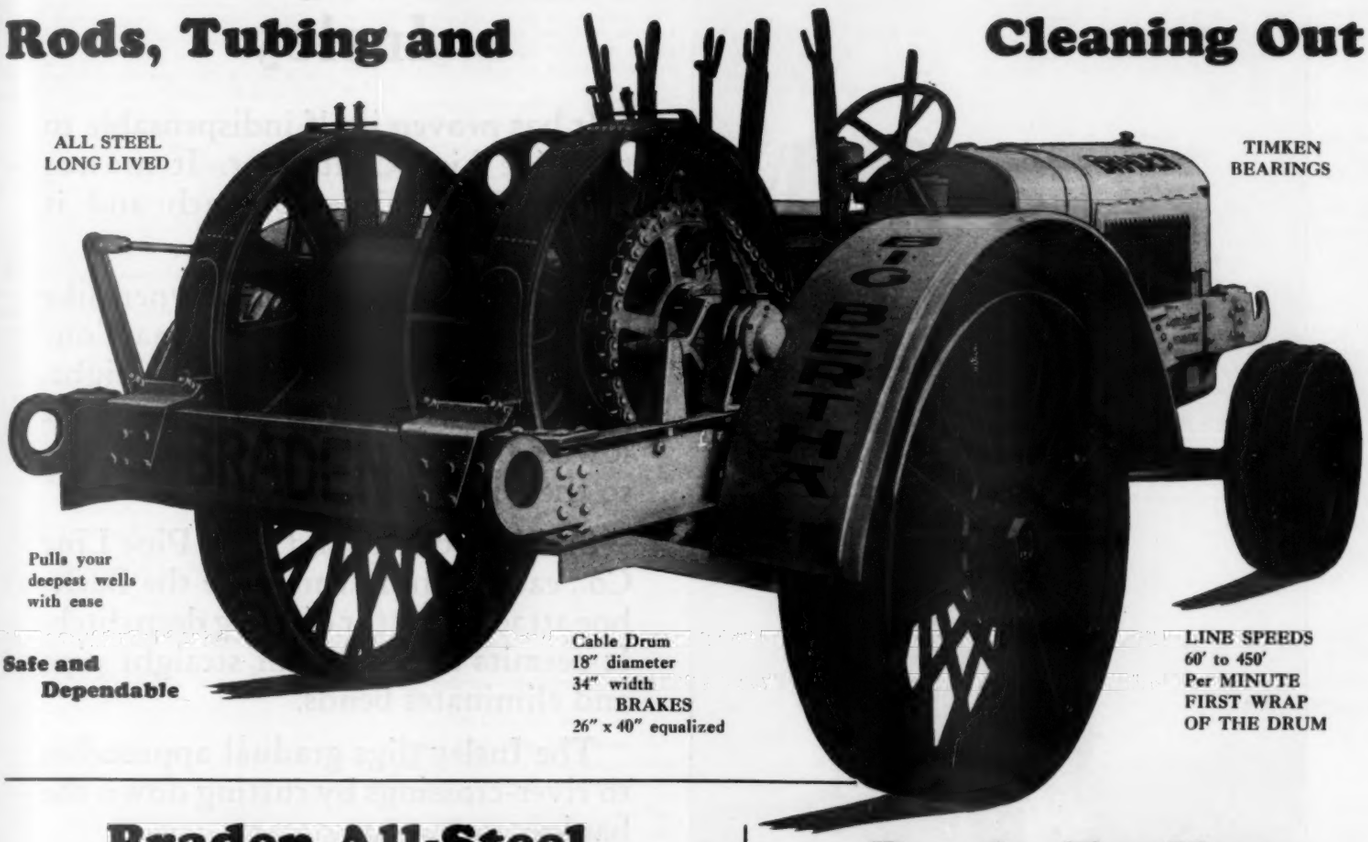

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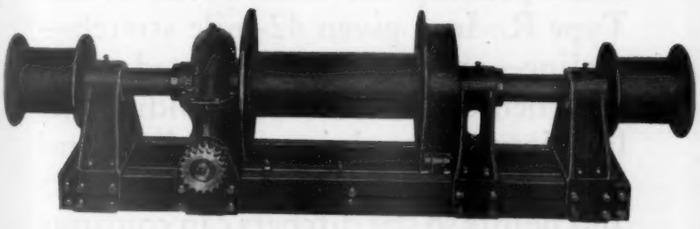

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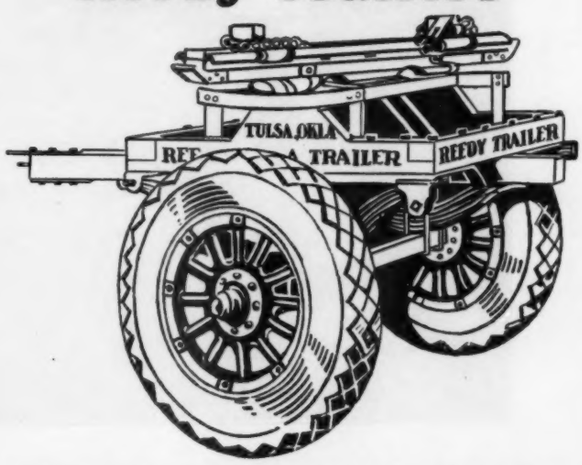

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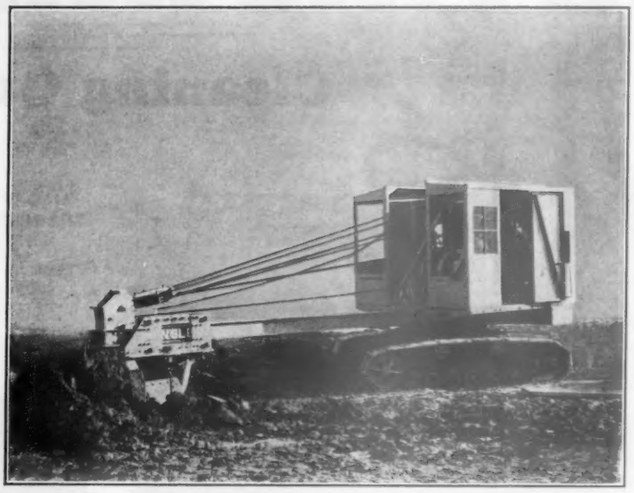

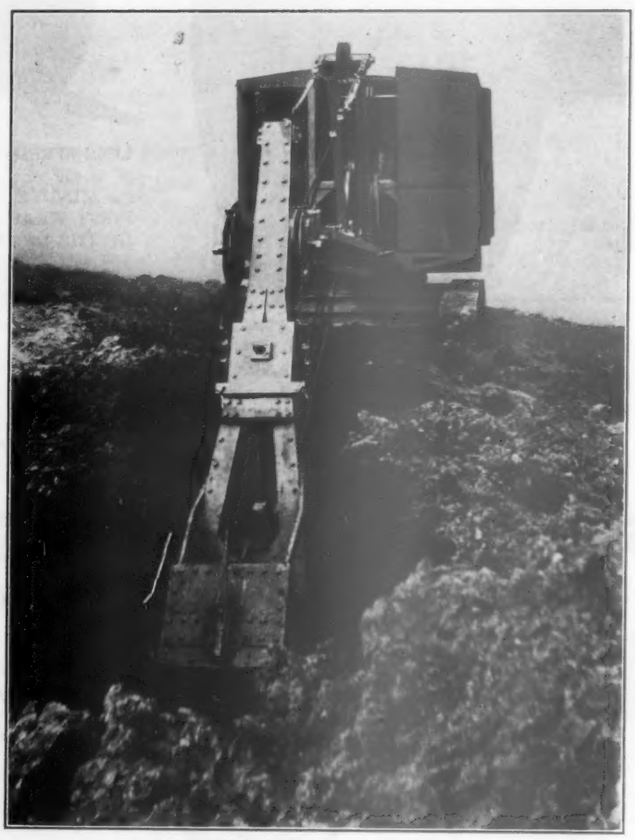

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It has proven itself indispensable to the Pipe Line Contractor. It makes right-of-way, river-approach and it does deep-ditching.

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The INSLEY keeps it working.

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of any system of parallel lines:

$$E = \frac{L\,d^5 eg}{(d_1^{5/2}+d_2^{5/2}+\dots d_n^{5/2})^2} = \frac{L}{\dfrac{(d_1^{5/2}+d_2^{5/2}+\dots d_n^{5/2})^2}{d^5 eg}} = \frac{L}{K}$$

If the system consists of n parallel lines, all of the same diameter, E becomes

$$E = \frac{L}{n^2}$$

The general looping formula remains the same

$$\lambda = \frac{K_1 K_2}{K_2 - K_1}(E_1 - E_2),$$

k being determined as indicated above.

The special looping formula, i.e., all lines and loop of the same diameter, n lines before looping, may be written as follows:

$$E_1 = \frac{L}{n^2},\quad E_2 = \frac{\lambda}{(n+1)^2} + \frac{L-\lambda}{n^2} = \frac{\lambda}{(n+1)^2} + \frac{E_2 n^2 - \lambda}{n^2}, \text{ and}$$

$$\lambda = \frac{n^2(n+1)^2}{2n+1}(E_1 - E_2$$

In the formula $E = \dfrac{L}{K}$

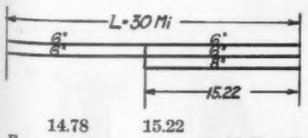
$$K = \frac{(d_1^{5/2}+d_2^{5/2}+\dots d_n^{5/2})^2}{d^5 eg}$$

If the equivalent line is assumed to be 8-inch, the factor k has the following values:

Arrangement of lines—	k
1-6"	0.253
2-6"	1.01
1-8"	1.00
3-6"	2.29
1-6"+1-8"	2.26
1-10"	3.12
4-6"	4.06
2-6"+1-8"	4.03
2-8"	4.00
5-6"	6.34
3-6"+1-8"	6.32
1-6"+2-8"	6.27
1-8"+1-10"	7.66
1-12"	7.69
6-6"	9.13
4-6"+1-8"	9.09
2-6"+2-8"	9.05
3-8"	9.00
7-6"	12.41
3-6"+2-8"	12.34
1-6"+3-8"	12.27
2-10"	12.48
2-8"+1-10"	14.18
1-8"+1-12"	14.23
4-6"+2-8"	16.10
2-6"+3-8"	16.04
4-8"	16.00
3-6"+3-8"	20.40
1-8"+2-10"	20.55
1-10"+1-12"	20.61
3-8"+1-10"	23.46
2-8"+1-12"	22.80
5-8"	25.00
3-10"	28.10
2-8"+2-10"	30.60
2-12"	30.70
4-8"+1-10"	33.30
3-8"+1-12"	33.30
6-8"	35.95
1-8"+3-10"	39.75
2-10"+1-12"	36.50
2-8"+2-10"	42.60
1-8"+2-12"	42.80
4-8"+1-12"	42.10
7-8"	49.10
2-8"+3-10"	53.4
1-10"+2-12"	53.4
4-8"+2-10"	56.8
2-8"+2-12"	56.9
3-10"+1-12"	65.2
3-8"+3-10"	68.9
3-12"	69.1
3-8"+2-12"	73.0
2-10"+2-12"	82.5
1-8"+3-12"	86.9
4-8"+2-12"	91.1
1-10"+3-12"	101.8
2-8"+3-12"	106.3
3-8"+3-12"	127.9

Problem

Reduce the following system to single equivalent 8-inch.



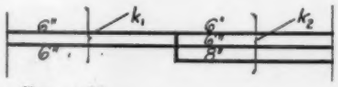
$$E = \frac{14.78}{1.01} + \frac{15.22}{4.03} = 18.43 \text{ miles.}$$

This solution is true only if the operating point of the line is at the extreme end of the turbulent flow region.

Problem

A parallel line system consisting of two 6-inch lines, 30 miles long, has a capacity of 800 bbls. per hour (704 pounds). The capacity of this system is to be increased to 25,000 bbls. per day = 1,040 bbls. per hour, by looping with 8-inch. How far does the loop have to extend, if the kinematic viscosity of the oil n = 0.27, and s = 0.86? The line is level.

The equivalent length of a single 8-inch, according to table:



From table

$k_1 = 1.01$ $\quad k_1 = 0.843$

$k_2 = 4.03$ $\quad k_2 = 3.12$

Friction coefficient taken into account.

$$E_1 = \frac{L}{k_1} = \frac{30}{1.01} = 29.7 \text{ miles.}$$

(35.6 miles with friction coefficient taken into account.)

$$E_2 = \frac{E_1 Q_1^2}{Q_2^2} = \frac{29.7 \times 800^2}{1{,}040^2} = 17.6 \text{ miles.}$$

(22.4 miles with friction coefficient taken into account.)

$E_1 - E_2 = 12.1$, and

$$\lambda = \frac{K_1 K_2}{K_2 - K_1}(E_1 - E_2) = \frac{1.01 \times 4.03 \times 12.1}{3.02}$$

$\lambda = 16.3$ miles of 8-inch loop. (15.22 miles with friction coefficient taken into account.)

(See Diagram 6)

General Pipe Line Equations

The general pipe line equation is based on Bernouille's theorem which may be stated as follows:

In any pipe, under steady flow without impact or friction, the gravity head plus the pressure head plus the velocity head is a constant quantity for every section.

$$\frac{V_1^2}{2g} + \frac{p_1}{\delta} + z_1 = \frac{V_2^2}{2g} + \frac{p_2}{\delta} + z_2$$

minus—All losses of head occurring between sections A and B.

(See Diagram 7)

In the above equation $\dfrac{V^2}{2g}$ is the velocity head, $\dfrac{p}{\delta}$ the pressure head, and z the gravity head.

p = Absolute pressure (lbs. per sq. ft.)

δ = Weight of liquid per cubic foot.

V = Velocity (feet per second).

z = Elevation of point above reference datum.

The line A-B connecting all the fluid levels in the piezometer tubes is called the hydraulic gradient. If the pipe is of uniform cross-section for its entire length the hydraulic gradient is practically a straight line. The velocities encountered in actual pipe line practice amount to only a few feet per second and their corresponding velocity heads are insignificant in comparison with the high pressures employed, so the terms $\dfrac{V^2}{2g}$ may be dropped from the equation without loss of accuracy in the results. The equation thus reduces to:

$$\frac{p_1}{\delta} + z_1 = \frac{p_2}{\delta} + z_2 \text{ plus loss of head}$$

due to friction and all other indeterminate losses.

(See Diagram 8)

Applied to an actual pipe line problem, where the line is of uniform diameter d, Bernouille's theorem may be written:

$$\text{Friction Head} = \frac{p_1}{\delta} - \frac{p_2}{\delta} + z_1 - z_2$$

(feet).

For the present we will assume that the discharge will be free at station B, hence

$$\text{Friction Head} = \frac{p_1}{\delta} + z_1 - z_2 \text{ (feet)}$$

Case 1.

Rate of Flow is Q_1

Under this condition of flow it is evident that the hydraulic gradient cuts the ground profile at point k, and that the section of the line between that point and station B is not running full. In other words, the pressure head in the line is zero at that point, and the friction head need be computed for section 1-2 only. The total pressure head required at station A is:

$$\frac{p_1}{\delta} = \text{Friction Head} + z_2 - z_1 \text{ (feet).}$$

$z_2 - z_1$ is known as the static head. By changing the expression into a form containing the equation for friction head in pounds per square inch and, remembering from elementary hydraulics that

P = 0.433 s h, in which

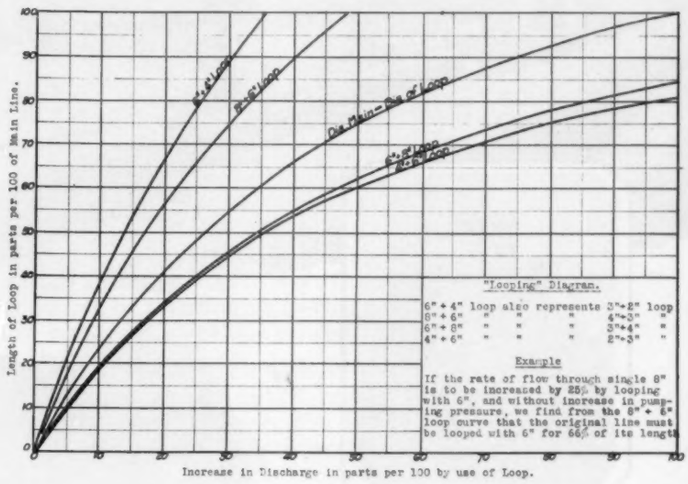
h = Head in feet

s = Specific gravity of oil

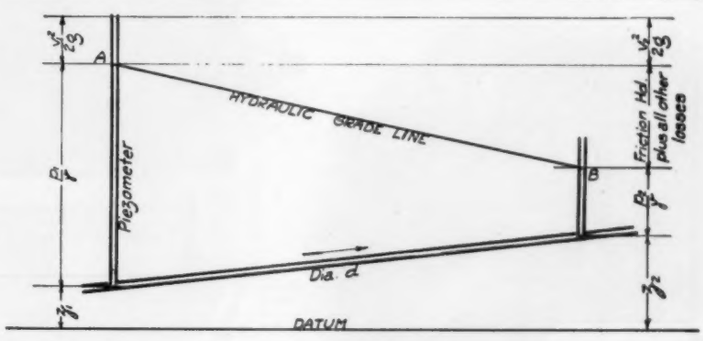
P = Pressure head in lbs. per sq. inch.

$$nP_1 = \text{Total pumping pressure at A} = \frac{fsLQ^2}{d^5} + 0.433\, s\,(z_2 - z_1)$$

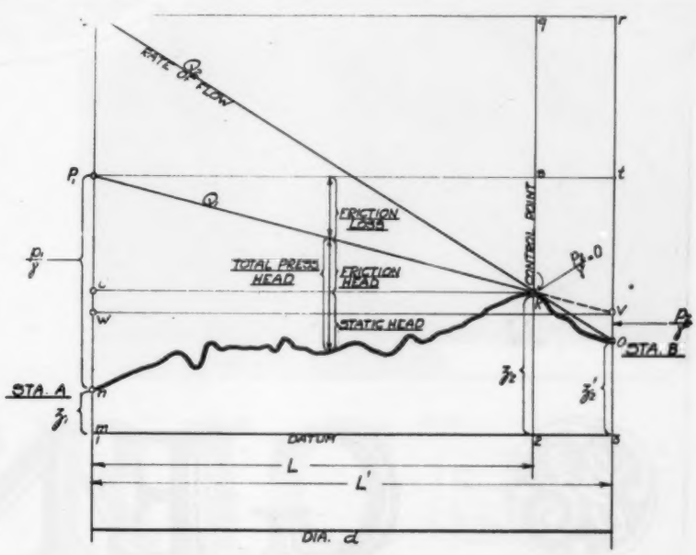
Pounds per square inch.


Length of Loop in parts per 100 of Main Line.
Increase in Discharge in parts per 100 by use of Loop.
8"+8" Loop
8"+6" Loop
Ca'Main-Rs of Loop
6"+6" Loop
4"+6" Loop
"Looping" Diagram.
6"+4" loop also represents 3"+2" loop
6"+6" " " " 4"+3" "
6"+8" " " " 5"+4" "
4"+6" " " " 2"+3" "
Example
If the rate of flow through single 8" is to be increased by 25% by looping with 6", and without increase in pumping pressure, we find from the 8"+6" loop curve that the original line must be looped with 6" for 66% of its length

(Diagram 6)



(Diagram 7)

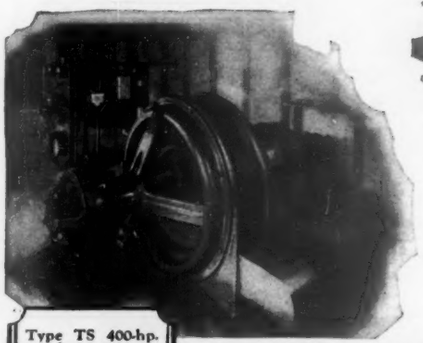


(Diagram 8)

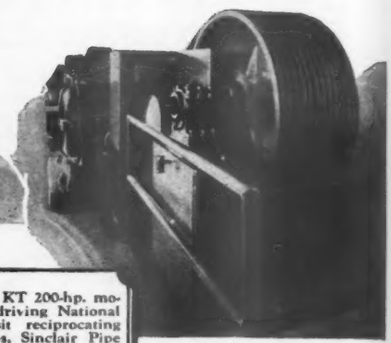
Modern

One of the 52 (200-ampere) G-E arc welders used by the Clark Welding Engineering Co., Waco, Texas, on the 205-mile pipe line from Jal, New Mexico to El Paso, Texas

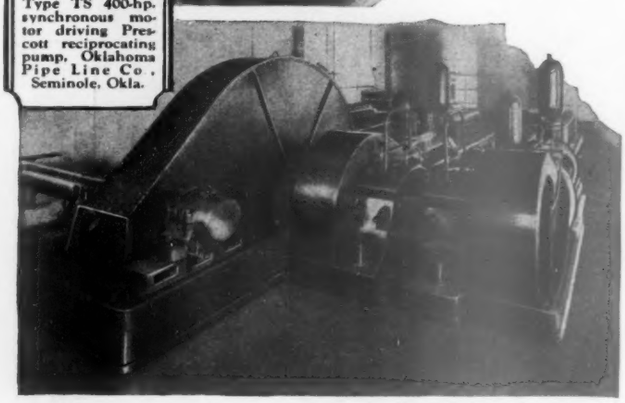
One of the largest motor-driven units in service. G-E 1000-hp. motor driving Cameron pump in station of Standard Pipe Line Co., Mandenville, Ark.

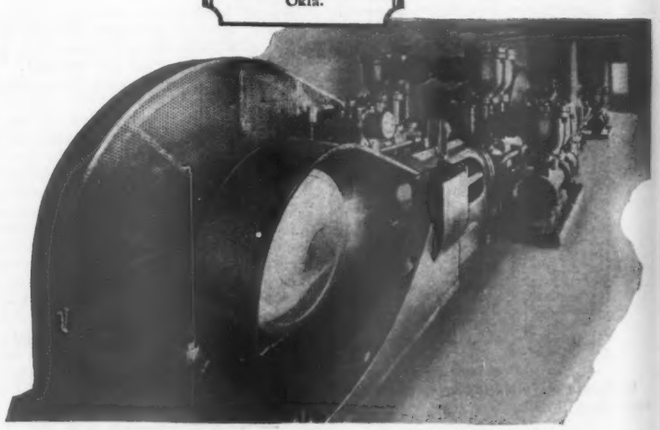


Type TS 400-hp. synchronous motor driving Prescott reciprocating pump, Oklahoma Pipe Line Co., Seminole, Okla.



Type KT 200-hp. motors driving National Transit reciprocating pumps, Sinclair Pipe Line Co., Seminole, Okla.





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built and operated *with* G-E equipment

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Mile after mile of new pipe line is being built with G-E arc-welding sets. And G-E motors and controllers are operating hundreds of pumps, both reciprocating and centrifugal.

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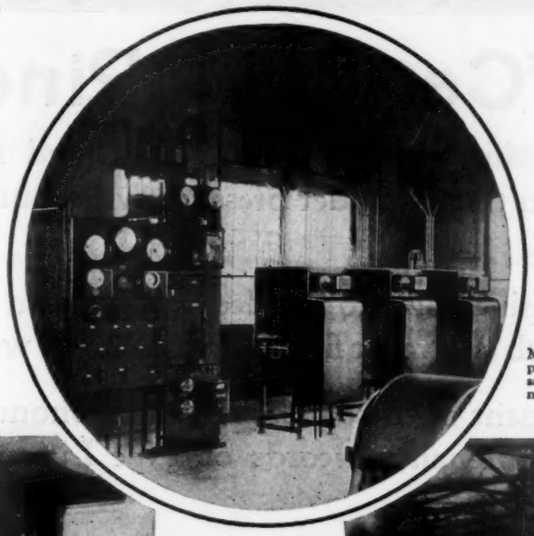
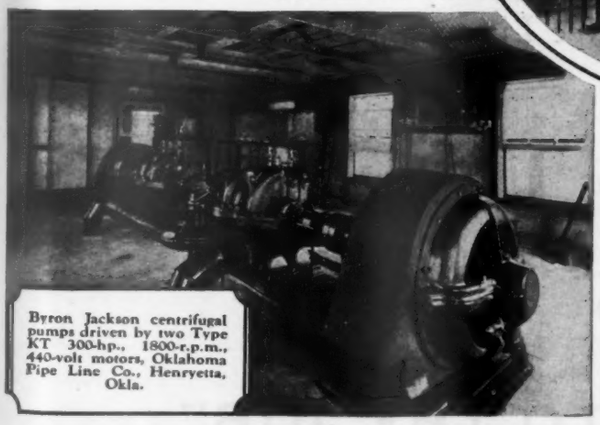
General Electric motors have proved their worth in years of operations on pipe lines. Now, a new application is announced which means new economies for the operator. This method assures maximum station pressure, regardless of the viscosity of the oil, by utilizing a slip-ring motor on a low-head, full-capacity centrifugal pump.

Inquire at the nearest G-E office for full information on General Electric apparatus which is contributing to the development of the petroleum industry in all its phases.



Master control panel, incoming-line panel, and three automatic compensators for 250-hp., 2200-volt induction motors, Magnolia Pipe Line Co., Bowie, Texas



Byron Jackson centrifugal pumps driven by two Type KT 300-hp., 1800-r.p.m., 440-volt motors, Oklahoma Pipe Line Co., Henryetta, Okla.

Six Type KT 250-hp., 3600-r.p.m., 2200-volt motors driving Worthington centrifugal pumps, Magnolia Pipe Line Co., McComb, Okla.

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"FROM THE TREE TO THE JOB"

Case 2.
Rate of Flow Q_2

The hydraulic gradient does not cut the ground profile, and the pumping pressure at station A becomes:

$\overline{nP_2}$ = Pumping pressure at A

$$= \frac{fsL^1Q_2^2}{d^5} + 0.433\ s\ (z_2^1 - z_1)$$ lbs. per square inch.

Deg. A.P.I.	Sp. gr.	Lbs. per sq. inch per ft. of head	Deg. A.P.I.	Sp. gr.	Lbs. per sq. inch per ft. of head
10	1.000	0.433	31	0.871	0.377
11	0.993	0.430	32	0.865	0.374
12	0.986	0.427	33	0.860	0.372
13	0.979	0.424	34	0.855	0.370
14	0.973	0.421	35	0.850	0.368
15	0.966	0.418	36	0.845	0.365
16	0.959	0.415	37	0.840	0.363
17	0.953	0.412	38	0.835	0.361
18	0.947	0.410	39	0.830	0.359
19	0.940	0.407	40	0.825	0.357
20	0.934	0.404	41	0.820	0.355
21	0.928	0.402	42	0.816	0.353
22	0.922	0.399	43	0.811	0.350
23	0.916	0.396	44	0.806	0.348
24	0.910	0.394	45	0.802	0.346
25	0.904	0.391	46	0.797	0.345
26	0.898	0.389	47	0.793	0.343
27	0.893	0.386	48	0.788	0.341
28	0.887	0.384	49	0.784	0.339
29	0.882	0.381	50	0.780	0.337
30	0.876	0.379			

Pressure (pounds per square inch)—Head (feet) $P = 0.433sh$

Case 3.
Rate of Flow Q_3

In cases 1 and 2 we assumed that the discharge at the terminal station was free. In the present case we will consider the condition of discharging the flow against the head ov at the terminal station B. This amount of head may be utilized as "intake pressure" on the pumps of station B. As may readily be seen from the preceding figure, this useful "intake pressure" does not increase the pumping pressure and, consequently, the power to be expended at station A.

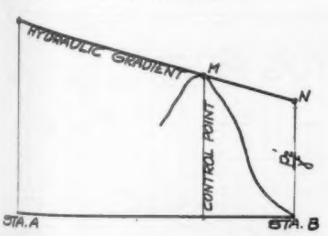
Again applying Bernouille's theorem, the friction head in this case is

$$\text{Friction Head} = \frac{P_1}{\delta} - \frac{P_2^1}{\delta} + z_2^1 - z_1$$ (feet)

$$\frac{P_1}{\delta} = \text{Friction Head} + \frac{P_2^1}{\delta} - z_2^1 + z_1$$

(feet), and Pumping pressure $\overline{nP_1} = \frac{fsLQ_3^2}{d^5} + \frac{0.433\ sP}{1448} - 0.433s(z_2^1 - z_1)$ (pounds per square inch).

Forrest M. Towl in Day's Handbook of Petroleum quotes a test made at Cameron Mills, N. Y., in 1894. "The pump when running with 900 pounds pressure required 39.000 pounds of coal per day; after connecting up the intake pressure system, the pump running at the same speed and pressure and with 265 pounds intake pressure required only 27,000 pounds of fuel, and the pump ran better with the intake pressure. This test showed that the saving was more than proportionate to the work done. The reason for this was undoubtedly that the boilers were, in that case more economical under the reduced load."



In practice it has been found that all but about 50 feet of $\frac{P_2^1}{\delta}$ can be utilized for intake pressure.

(See Diagram 9)

Compound Lines and Looped Lines

In the preceding sections the pipe line was assumed to be of uniform cross-section throughout its length, and in that case the hydraulic gradient was found to be a straight line. If the pipe line is made up of successive sections of different diameter, the hydraulic gradient is changed to a form shown in the next diagram. The same holds true for a looped line. Again applying Bernouille's theorem the total pumping pressure at A is determined in the following manner:

$$\text{Friction Head} = \frac{P_1}{\delta} + z_1 - z_2 \text{ (feet).}$$

(See Diagram 10)

Pressure at A $= \overline{nP_2} =$

$$\frac{f_1sL_1Q^2}{d_1^5} + \frac{feg\ s\ EQ^2}{d^5eg} + 0.433s(z_2 - z_1)$$

pounds per square inch.

In this equation E is the equivalent length of a single line of diameter deg for section L_2

$$E = \frac{L_2\, d^5eg}{feg\left(\frac{d_2^{5/2}}{\sqrt{f_2}} + \frac{d_3^{5/2}}{\sqrt{f_3}}\right)^5}$$

$$\overline{nP_1} = \frac{f_1sL_1Q^2}{d_1^5} + \frac{sL_2Q^2}{\left(\frac{d_2^{5/2}}{\sqrt{f_2}} + \frac{d_3^{5/2}}{\sqrt{f_3}}\right)^5} + 0.433s(z_2 - z_1)$$ lbs. per square inch.

It is clear from the diagram that as far as the pumping pressure at A is concerned the location of the loop is immaterial. It is the usual custom to locate the loop as near to station B as possible as the general pressure conditions in the line are much lower that way than if the loop were located at the end near station A. In this problem the rate of flow Q is such that the section C-B of the line is not running full.

Sometimes the control point changes along the line. Take the case of the single line (3). As long as the pumping pressure is nm or less, the control point is at F. When $\frac{P_1}{\delta} > nm$ the control point shifts to point G.

In the case of line system (1), at the rate of flow corresponding to the pressure gradient indicated, the control point is at F, while with an arrangement as indicated by (2), the control point is at G, even though the rate of flow is the same.

(See Diagram 11)

Location of Loop (1)

$$(1)\qquad \overline{nP_1} = \frac{f_1s(L_1 - \lambda_1)Q^2}{d_1^5} + \frac{s\lambda_1^5Q^2}{\left(\frac{d_2^{5/2}}{\sqrt{f_2}} + \frac{d_3^{5/2}}{\sqrt{f_3}}\right)^5} + 0.433sz_2$$

(lbs. per square inch).

Location of Loop (2)

$\lambda_1 = \lambda_2$

$$(2)\qquad \overline{nP_1} = \frac{s\lambda_2Q^2}{\left(\frac{d_2^{5/2}}{\sqrt{f_2}} + \frac{d_3^{5/2}}{\sqrt{f_3}}\right)^5} + \frac{f_1s(L_2 - \lambda_2)Q^2}{d_1^5} + 0.433\ sz_2^1$$

(lbs. per square inch).

It is to be noticed that the pumping pressure at station A is the same for (1) and (2), when Q is the same. In equations 1 and 2 $L_2 > L_1$ and $(L_2 - \lambda_2) > (L_1 - \lambda_1)$, but the greater friction head is counterbalanced by the difference in elevation of points F and G, i.e., z_2 and z_2^1.

Leander-Tug River

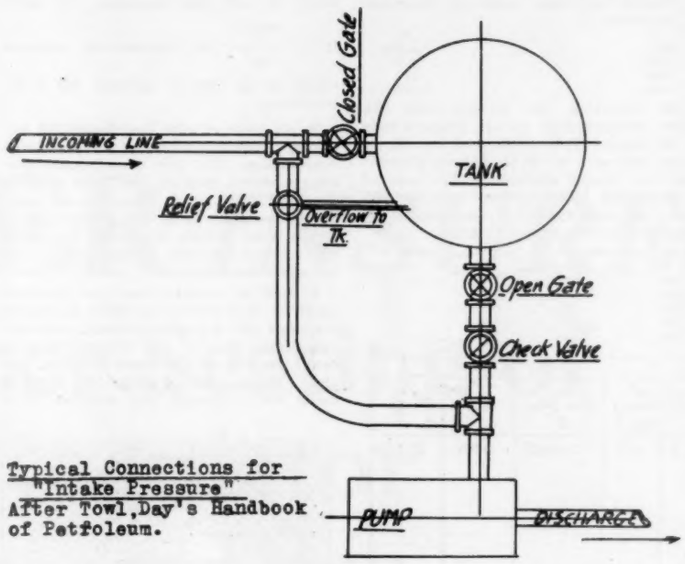
Note—Friction factors in this example are taken from curve C-D in the diagram.

(See Diagram 12)

Physical Characteristics of Oil

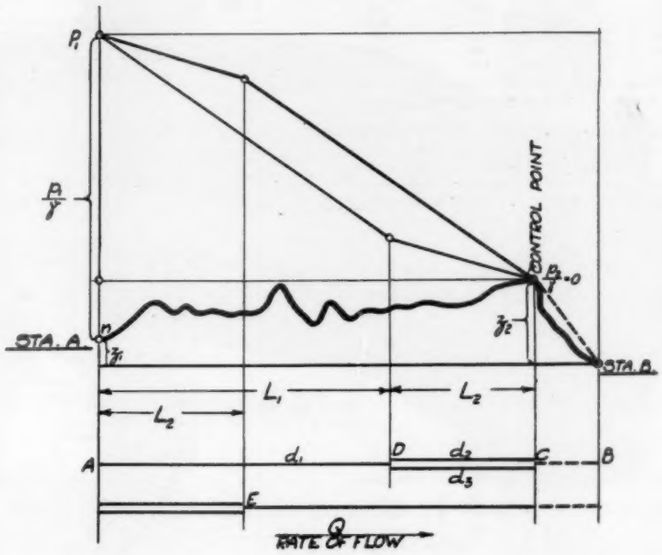
Temp.	Absolute viscosity (Poises)	Specific gravity	Kinematic viscosity	h — p
40°F.	0.1903	0.8443	0.226	2.74
60°F.	0.1303	0.8363	0.156	2.76
80°F.	0.0845	0.8283	0.102	2.79

The gauge pressure at Leander, so long as Q < (640 bbls. per hour at 40 deg. F. (670 bbls. per hour at 60 deg. F. (705 bbls. per hour at 80 deg. F.

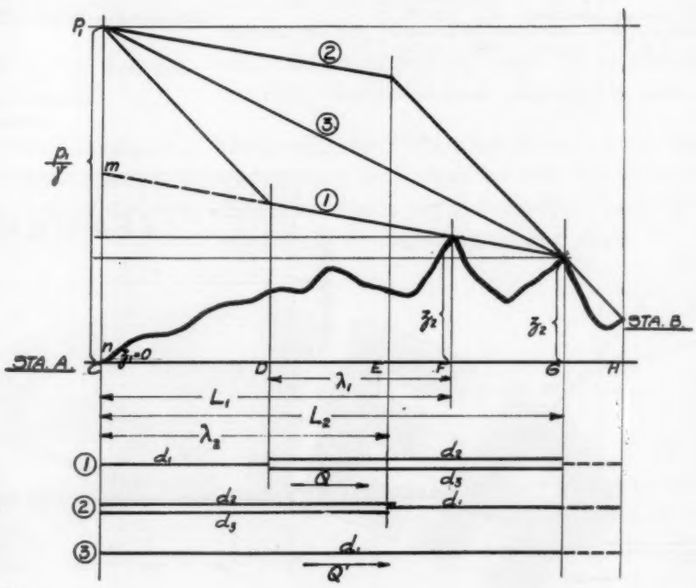


Typical Connections for "Intake Pressure" After Towl, Day's Handbook of Petroleum.

(Diagram 9)



(Diagram 10)



(Diagram 11)

$$nP_1 = \frac{sL_1Q^2}{\left(\frac{d_1^{5/2}}{\sqrt{f_1}} + \frac{d_2^{5/2}}{\sqrt{f_2}}\right)^2} + \frac{fsL_2Q^2}{d_{av}^5} + 0.433\ s(z_2 - z_1)$$

(lbs. per square inch).

f_1 is the friction factor for 6-inch line when the rate of flow $Q_1 = \frac{Q}{2}$

f_2 is the friction factor for 6-inch line when the rate of flow $Q_2 = \frac{Q}{2}$

f is the friction factor for 6-inch line when the rate of flow $Q = Q_1 + Q_2$

40 Degrees Fahrenheit

Q	f	$Q_1 = Q_2$	$f_1 = f_2$	$\sqrt{f_1} = \sqrt{f_2}$	$d_1^{5/2} = d_2^{5/2}$	Temp. Deg. F.	Spec. Grav. s	d_{av}^5	$\eta = \frac{\mu}{s}$
100	1.3	50	2.3	1.51	90.6	40°	0.8443	8206	0.226
200	1.5	100	1.3	1.14					
250	1.43	125	1.12	1.06					
300	1.36	150	1.32	1.15					
400	1.27	200	1.50	1.23					
500	1.20	250	1.42	1.19					
600	1.14	300	1.36	1.17					
640	1.12	320	1.33	1.15					

Substituting these values in Equation 1, we get, when Q <640 bbls. per hour.

$$nP_1 = \frac{0.844 \times 23.1 \times 100 \times 100}{\left(\frac{90.6}{1.51} + \frac{90.6}{1.51}\right)^2} + \frac{1.3 \times 0.844 \times 1.12 \times 100 \times 100}{8{,}206}$$

$$0.433 + 0.844 \times (1{,}184 - 653) = 209 \text{ lbs.}$$

Q Bbls.	nP_1 Pounds
100	209
200	232
250	246
300	279
400	359
500	436
600	534
640	569

We find from inspection of the profile and hydraulic grade line that the control point changes from C to D when the rate of flow becomes 640 bbls. per hour. Hence the equation for gauge pressure assumes the form:

$$nP_1 = \frac{sL_1Q^2}{\left(\frac{d_1^{5/2}}{\sqrt{f_1}} + \frac{d_2^{5/2}}{\sqrt{f_2}}\right)^2} + \frac{fs(L_2 + L_3)Q^2}{8{,}206} + 0.433\ s(z_3 - z_1)$$

$L_2 + L_3 = 5.74$, $z_3 = 0$.

Substituting these values in Equation 2, we obtain

Q Bbls.	nP_1 Pounds
700	673
800	871
900	1,063

By repeating this process with the data corresponding to oil temperatures of 60 degrees Fahrenheit, and bearing in mind that with oil of 60 degrees Fahrenheit the control changes at the rate of flow of 670 bbls. per hour, and at 705 bbls. per hour for oil of temperature 80 degrees Fahrenheit, we obtain:

Temp. 60°F. Q	Pounds	Temp. 80°F. Q	Pounds
100	206	100	199
180	221	200	229
200	227	220	236
300	282	300	270
400	342	400	323
500	414	500	389
600	498	600	462
670	559	700	535
700	599	705	555
800	777	800	701
900	973	900	864

These values are plotted on the following diagram . The recording gauge charts show the gauge pressure nP_1 at Leander for an average rate of flow of 407 bbls. per hour, and it is seen that they agree quite closely with the computed gauge pressures. They also indicate very clearly the effect of the temperature as of February 1, March 24, and August 4, 1922.

(See Diagrams 13 and 14)

Graphical Design of Oil Pipe Lines

It is at once evident that the equation

$$P = \frac{fsLQ^2}{d^5}$$

is irreversible and that it cannot be solved directly in the form

$$Q = d^{5/2}\sqrt{\frac{P}{fsL}}$$

since f is a function of the unknown quantity Q. $\left(f = \phi\left(\frac{Q}{dn}\right)\right)$. If Q is to be determined for a given pressure head, it will be necessary to solve $P = \frac{fsLQ^2}{d^5}$ for successively assumed values of Q until it satisfies the given conditions.

In all cases of pipe line design the following design chart will be found of great convenience. Not only does it make possible a direct solution for Q at a given pressure head, but it also reduces many design problems to a very simple graphical process, which, otherwise, by means of ordinary analysis would lead to laborious computations,

It will be noticed that the chart is made up of a number of polar alignment diagrams and a profile diagram, and that practically all pipe line design problems can be solved by the combination of the two. The method of using the chart is made clear through the solution of a number of typical problems, which should be self-explanatory.

It may be well to mention that in laying off the ground profile, control points and elevations of initial and terminal stations, the elevation scale corresponding to the gravity of the oil must be used. This scale is on the left of the profile diagram of chart.

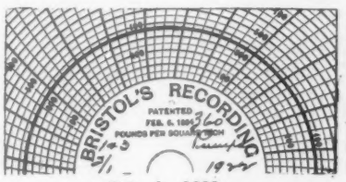
Problem

What is the capacity of a single 4-inch line, 19.6 miles long, with a gauge pressure of 800 pounds and both stations of the same elevation? The characteristics of the oil are as follows:

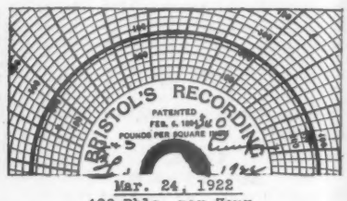
Kinematic Viscosity .. n = 0.17
Specific Gravity ..... s = 0.84
Diameter of Pipe .... d = 4.03

The pressure drop per mile = $\frac{P}{L} = \frac{800}{19.6} = 40.8$ pounds.

From chart for 4-inch pipe.

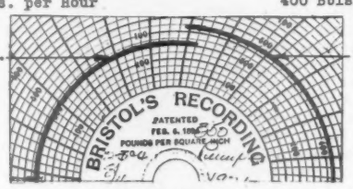


Feb. 1, 1922
400 Bbls. per Hour



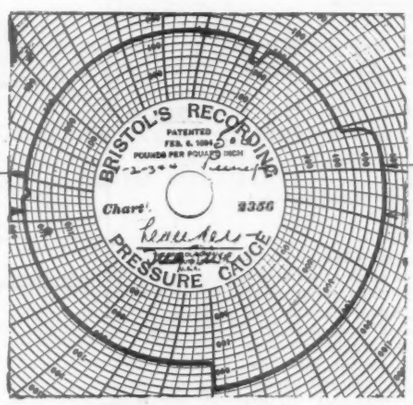
Mar. 24, 1922
400 Bbls. per Hour

400 Bbls. per Hr. — 570 Bbls. per Hr.



Aug. 4, 1922

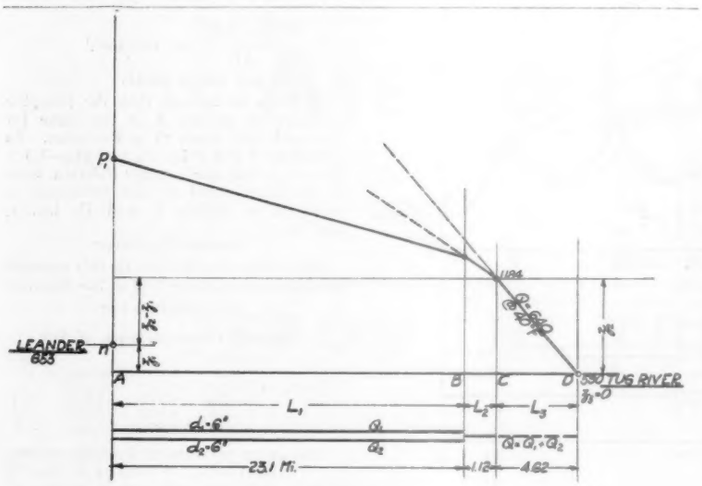
570 Bbls. per Hr. — 760 Bbls. Per Hr.



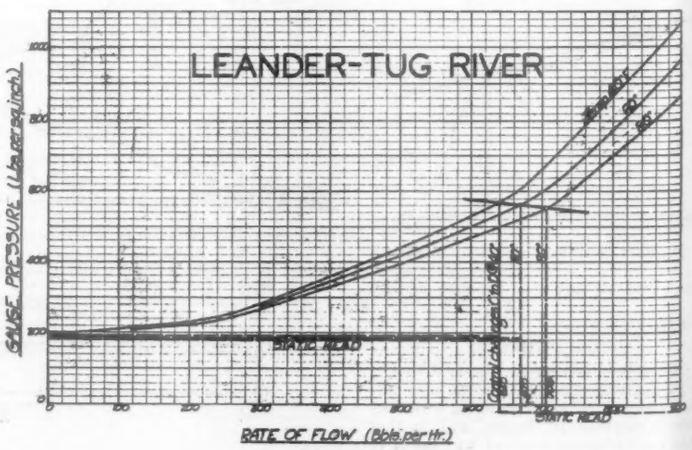
Leander - Tug River

(Diagram 13)

Q	f	$Q_1 = Q_2$	$f_1 = f_2$	$\sqrt{f_1} = \sqrt{f_2}$	$d_1^{5/2} = d_2^{5/2}$	Temp.	Spec. Grav.	d_{av}^5	$\eta = \frac{\mu}{s}$
700	1.1	350	1.31	1.14	90.6	40°F.	0.844	8206	0.226
800	1.08	400	1.28	1.13					
900	1.04	450	1.23	1.11					



(Diagram 12)



(Diagram 14)

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Steam and Oil Separators
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Gas Engine Fuel Regulators
Automatic Gas Relief Valves
Gas Pressure Regulators
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Liquefied Petroleum Gas Regulators
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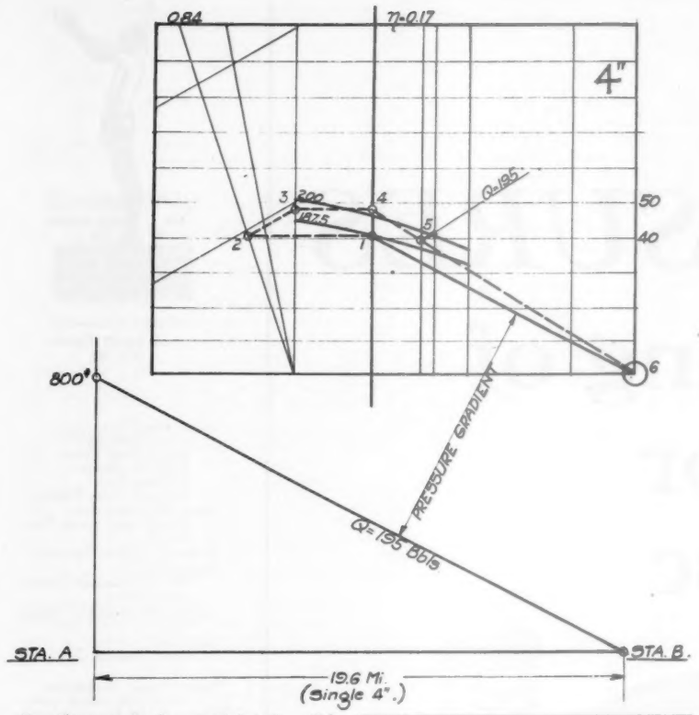


On diagram begin at Point 1, 40.8 pounds, to S = 0.84, 2, through 3 and 4. The intersection of line 4-6 with the viscosity scale gives the point 5, from which Q = 195 bbls. per hour.

Problem

What is the gauge pressure required for pumping 195 bbls. per hour through 19.6 miles of single 4-inch, when the characteristics of the oil are:

n = 0.17 s = 0.84

Both stations have the same elevation.

On 4-inch diagram produce line 6-4 through the intersection given by n = 0.17 and Q = 195. This line represents the pressure gradient for oil of specific gravity s = 1.0. Extending 6-4 to point 2, specific gravity is s = 0.84, and then back to the index line, we obtain for the required pressure gradient $\frac{P}{L}$ = 40.8, or P = 800 pounds. The line 1-6 represents $\frac{P}{L}$ graphically, and may be translated directly to the profile diagram.

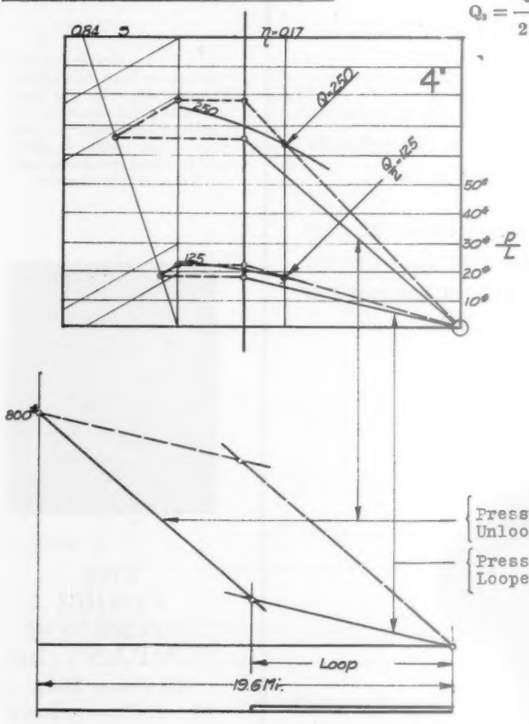
Problem

A single 4-inch line 19.6 miles long has a capacity of 195 bbls. per hour for oil n = 0.17 and s = 0.84 at 800-pound gauge. Both stations have the same elevation. How far does this line have to be looped with 4-inch pipe if the capacity is to be increased to 250 bbls. per hour?

$$Q = Q_1 + Q_2$$

$$Q_1 = \frac{Q}{2}$$

$$Q_2 = \frac{Q}{2}$$



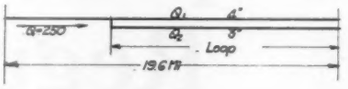
Problem

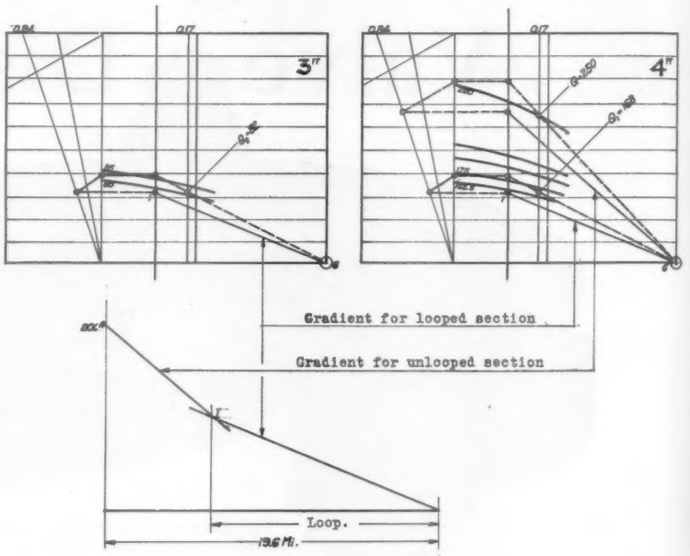
A single 4-inch line, 19.6 miles long, has a capacity of 195 bbls. per hour for oil n = 0.17 and s = 0.84, at 800-pound gauge. Both stations have the same elevation. How far does this line have to be looped with 3-inch pipe if the capacity is to be increased to 250 bbls. per hour?

On profile diagram lay off gradient for Q = 250 through single 4-inch, beginning at 800 pounds. It is obvious that the pressure gradients in the looped section must be parallel for both the 3-inch and 4-inch components. On alignment charts draw parallel gradients (1-6) for both 3-inch and 4-inch lines, and repeat until it satisfies condition.

$$Q_1 + Q_2 = Q\ (250)$$

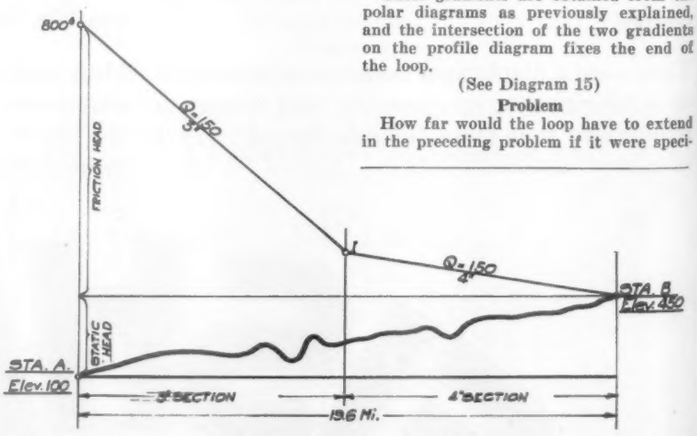
Make parallel translation of gradient 1-6 thus found to profile diagram, and intersection I fixes end of loop.





Problem

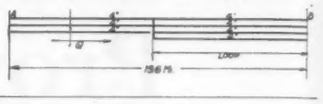
A series line consisting of 3-inch and 4-inch pipe, 19.6 miles long, and handling oil of kinematic viscosity n = 0.17, and specific gravity s = 0.84, is to be designed for a capacity of 150 bbls. per hour. How long will the 4-inch section have to be, in order that the line have the desired capacity if the pumping pressure is 800 pounds? The elevation of terminal station is 350 feet higher than station A.



On polar diagrams determine pressure gradients for Q = 150 bbls. for both 3-inch and 4-inch pipe, as explained in a previous example. Lay off 800 pounds pressure head at initial station and also plot station B 350 feet higher than station A, and 19.6 miles from point of beginning. Care must be taken that for the vertical scale on ground profile the scale corresponding to s = 0.84 be chosen. Translate the pressure gradients previously found to the profile diagram as indicated in figure. and intersection I fixes the end of 4-inch section.

Problem

A pipe line system consistsing of three 4-inch lines, 19.6 miles long, has a capacity of 585 bbls. per hour at 800 pounds pressure. The characteristics of the oil are n = 0.17 and s = 0.84. How far does the system have to be looped with 4-inch to make its capacity 660 bbls. per hour? The line is assumed to be level.



Section A-B—Since all lines of the system are 4-inch, the gradient is the same as for one 4-inch line at rate of flow $\frac{Q}{3}$.

Section B-C—The gradient for this section is the same as for one 4-inch line at rate of flow $\frac{Q}{4}$.

These gradients are obtained from the polar diagrams as previously explained, and the intersection of the two gradients on the profile diagram fixes the end of the loop.

(See Diagram 15)

Problem

How far would the loop have to extend in the preceding problem if it were specified that the loop be connected into one line only?

(See Diagram 16)

From the polar diagrams it may easily be ascertained that the capacity of a single 4-inch line is 195 bbls. per hour at 800 pounds, the length of line and physic-

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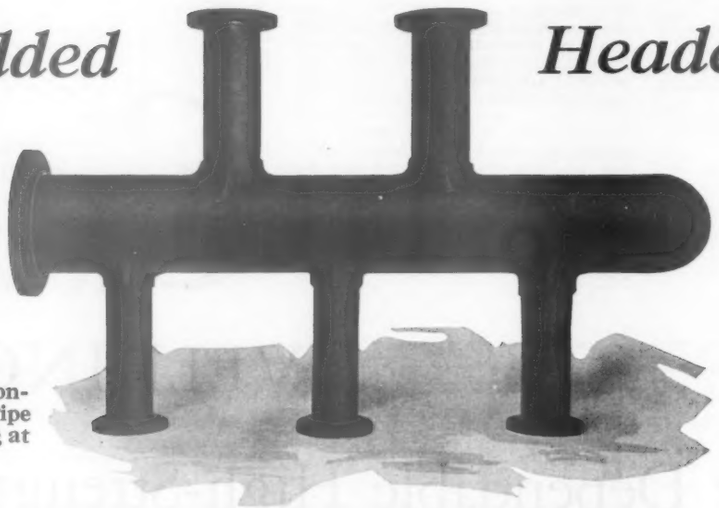

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River Crossing for Mississippi River Fuel Corp.

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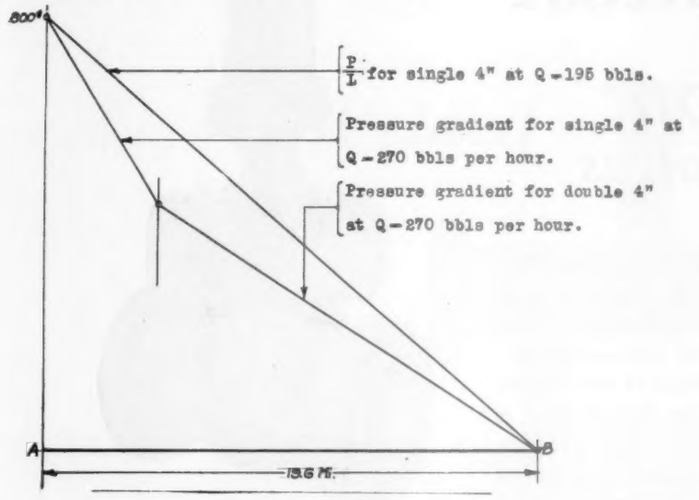
al characteristics of oil being the same as heretofore. It is obvious that the problem thus resolves itself into designing number three line for a capacity of

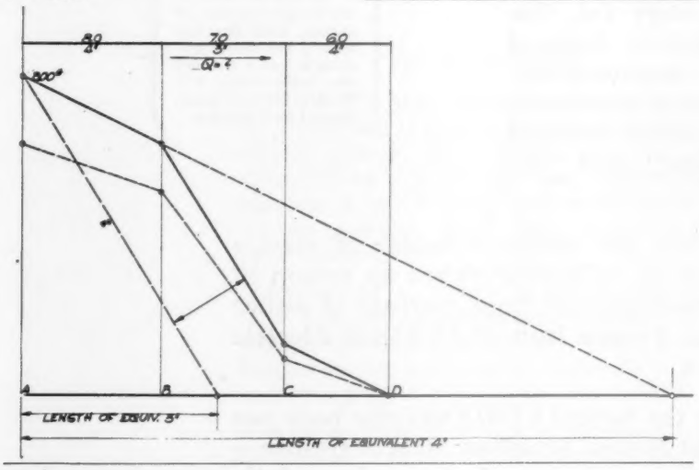
Q—2×195 = 660—390 = 270 bbls.

which may be accomplished in the manner shown before.



Problem

What is the hourly capacity of the following series system of lines at 800 pounds? Characteristics of oil n = 0.17, s = 0.84.



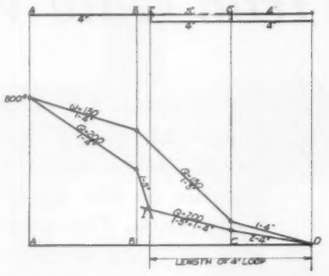
Assume rate of flow Q, and lay off pressure gradients corresponding to that rate beginning at point D . Make trials until end of grade lines reaches the point of specified initial pressure, in this case 800 pounds.

Problem

What is the length of equivalent 3-inch of this system? Translate the 3-inch gradient to the initial pressure point, and the intersection of this gradient with the horizontal scale of miles gives the length of equivalent 3-inch for this series system. Equivalent 4-inch may be obtained in the same manner.

Problem

How far does the series system shown in sketch have to be looped with 4-inch (position of loop E-D) if the capacity of system is to be 200 bbls. per hour, pumping pressure 800 pounds, and characteristics of oil n = 0.17, and s = 0.84? The main line and loop are assumed to have a cross-over connection at point C.



Section A-B—Draw grade line for Q = 200 bbls. through one 4-inch.

Section B-E—Draw grade line for Q = 200 bbls. through one 3-inch.

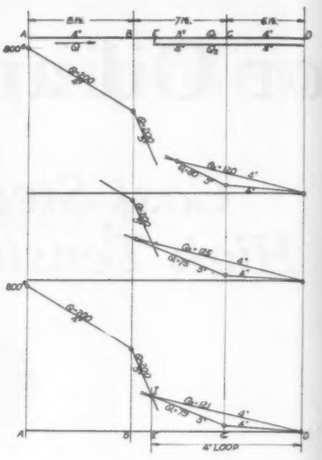
Section D-C—Draw grade line for $Q = \frac{Q}{2} = 100$ bbls. through one 4-inch.

Section C-E—Draw grade line for Q = 200 divided between the 4-inch and 3-inch lines. Grade for this section may be obtained in manner shown in a previous problem.

The intersection I establishes the end of loop.

Problem

Given the series line system shown in sketch below. Characteristics of oil n = 0.17 and s = 0.84. The capacity of this system is to be increased to 200 bbls. per hour by looping with 4-inch, beginning at point E and extending to station B. The pumping pressure is 800 pounds. Locate terminal point E of loop.



$Q_1 + Q_2 = Q$

First trial—For section E-D assume that Q = 80. Q = 120. Draw pressure gradients beginning at D.

Second trial—Assume Q = 75. Q = 125.

Third trial—Q = 70. Q = 121.

Continue with trials until all three grade lines intersect in one common point at I. The distance E-D then represents the length of required 4-inch loop.

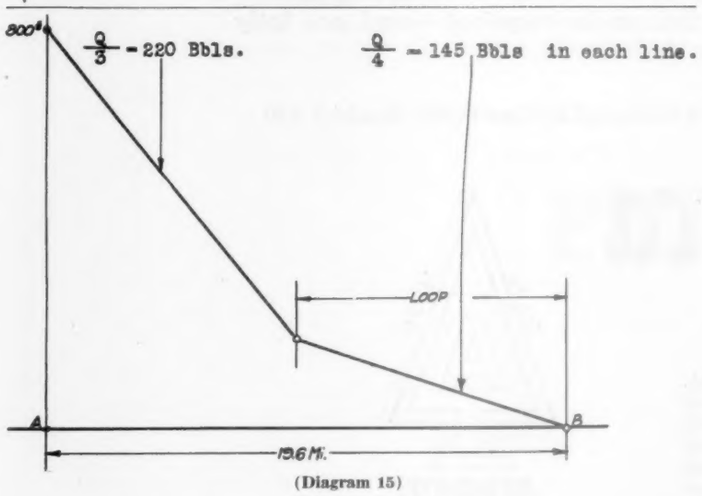
Problem

Let it be required to find gauge pressures at both stations A and C, if the former is pumping at the rate of 230 bbls. per hour, and the latter at 50 bbls. per hour. The character of the oil handled is as follows:

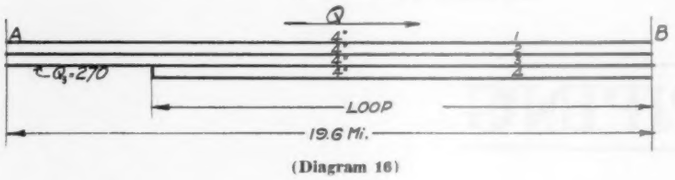
n = 0.167, s = 0.840 at 50 degrees Fahrenheit.

The system consists of 4-inch pipe throughout. The distances between stations are shown on the accompanying sketch.

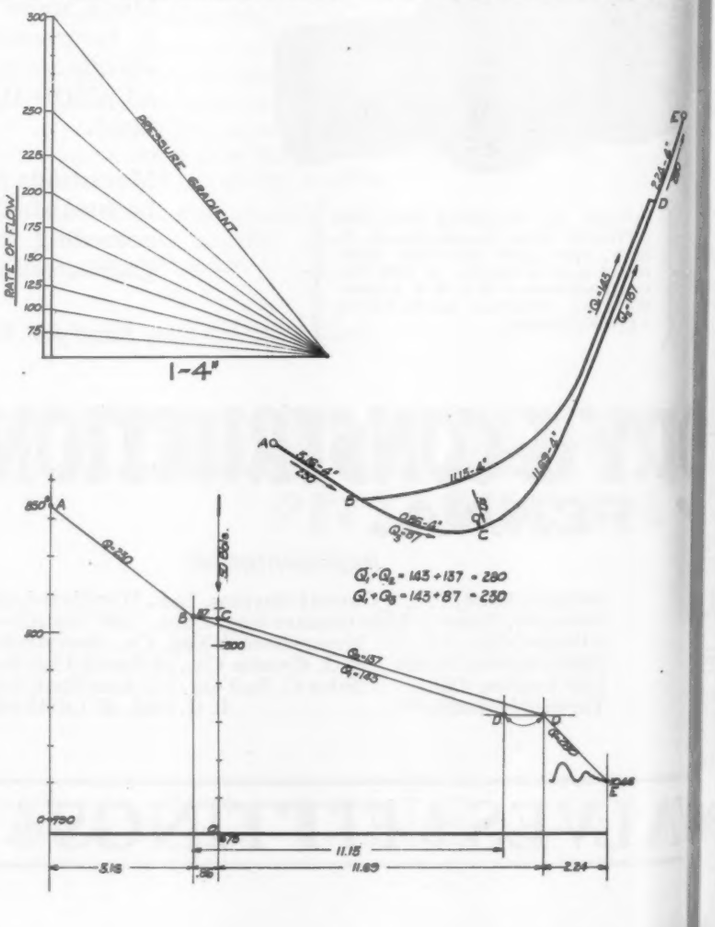
First lay off stations on profile dia-



(Diagram 15)



(Diagram 16)



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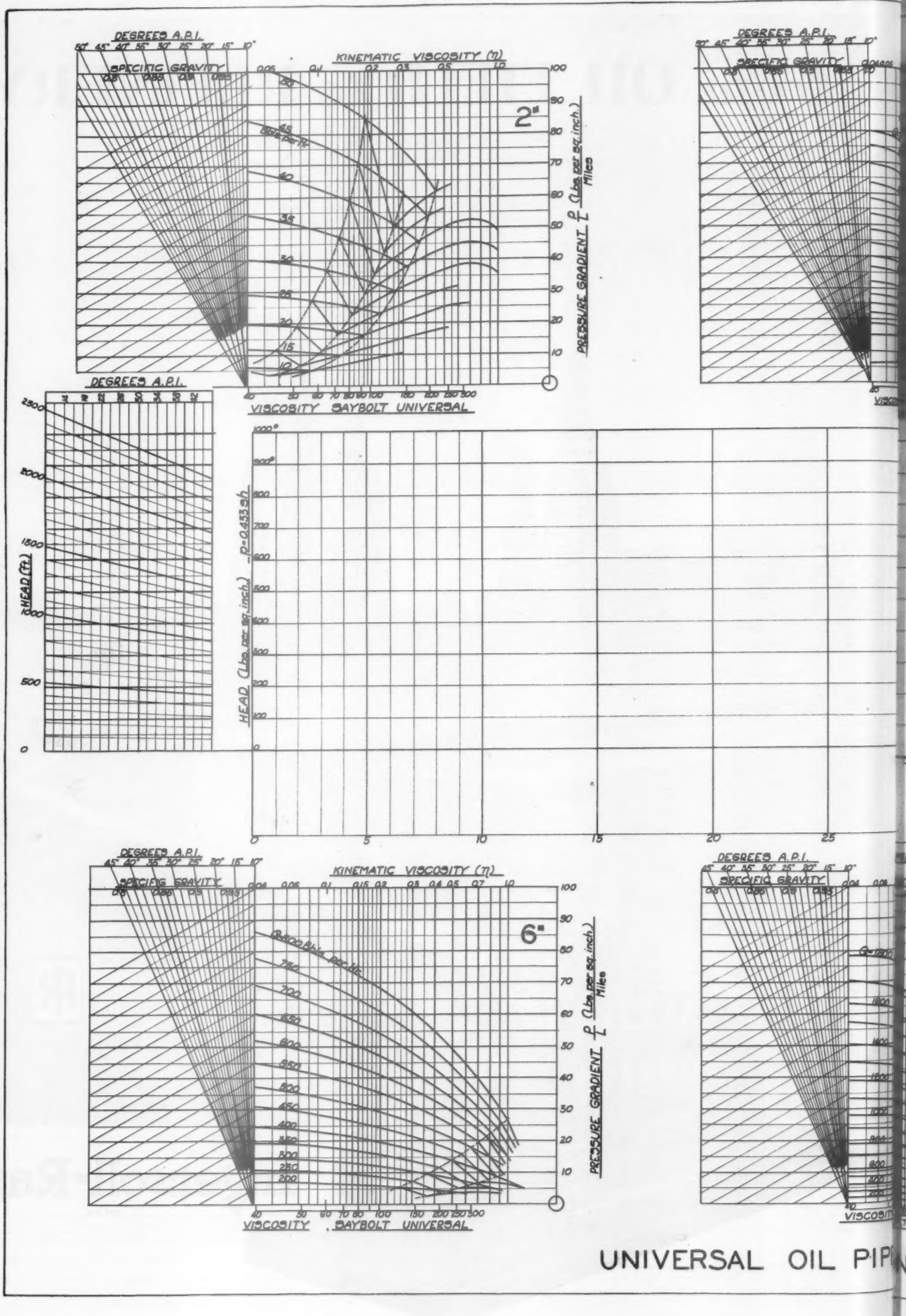

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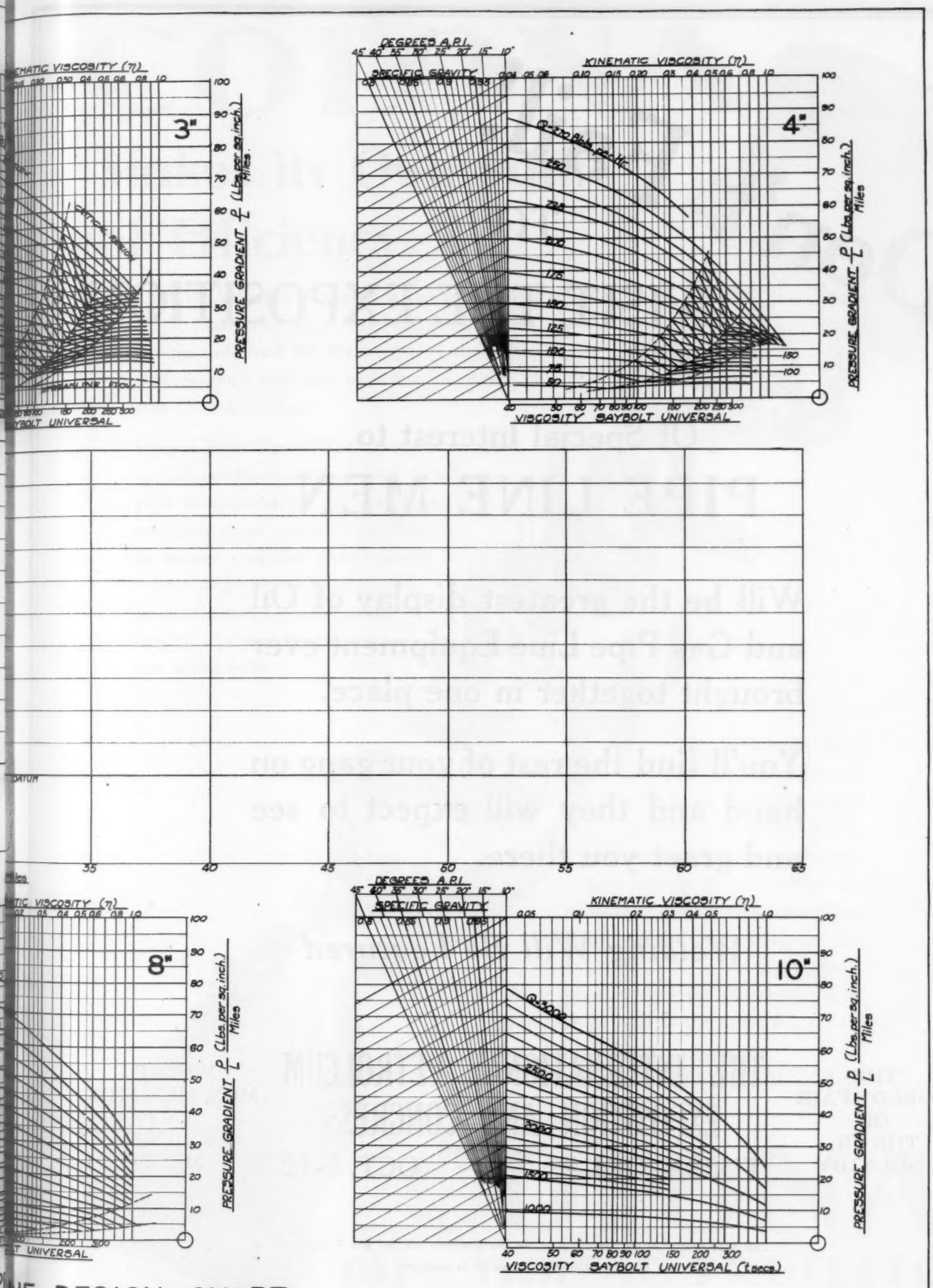

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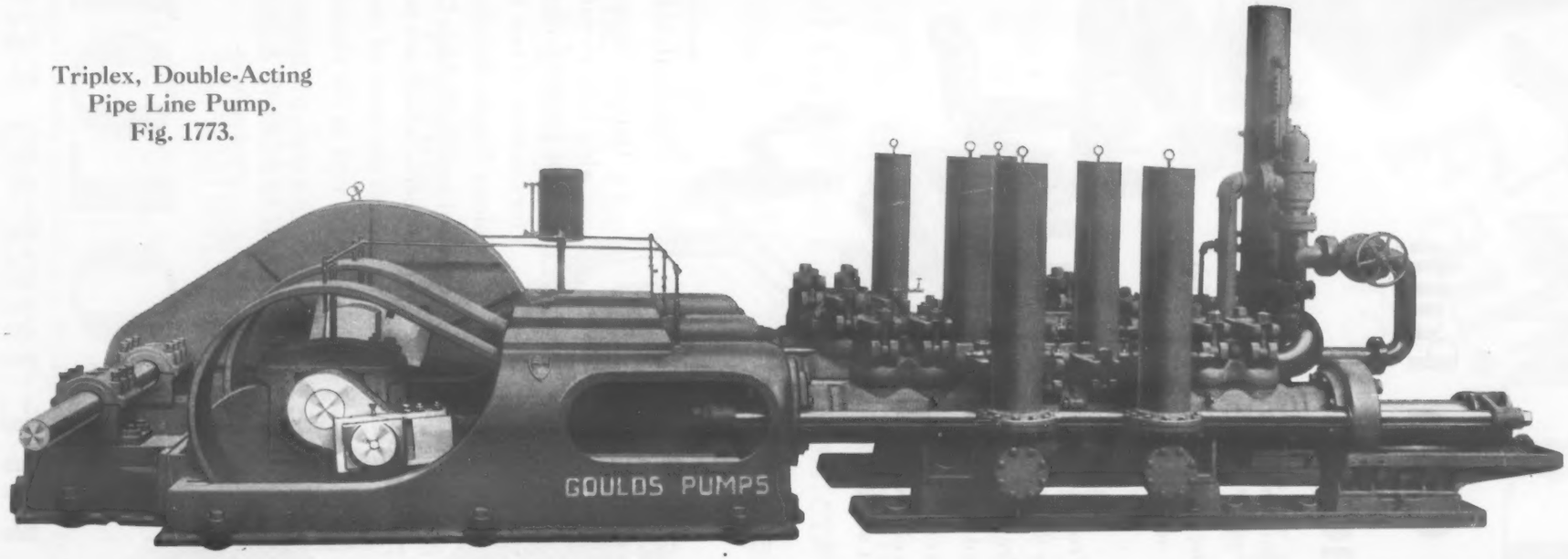

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gram as explained before, taking care, however, that the vertical foot-elevation scale be chosen so as to satisfy

$$h = \frac{p}{0.433\ s}$$

Also prepare pressure gradient diagram for this particular grade of oil to be handled, either from the Universal Chart, or else by means of the fundamental pressure drop equation

$$P = \frac{f\ s\ L\ Q^2}{d^5}$$

Beginning at point E, lay off gradient corresponding to 280 bbls. per hour by translating from gradient diagram. It is at once evident that the pressure drop between B and D is the same for both components of the system, and we further know from the given conditions of the problem that

$$Q_1 + Q_2 = 280 \text{ bbls., and}$$
$$Q_1 + Q_3 = 230 \text{ bbls.}$$

Noticing that the loop is slightly shorter than the main branch of the system, the junction point D appears as a double point on the profile diagram, namely 11.15 and 12.55 miles from point B. However both points D on profile diagram represent the one actual junction point of loop and main line at D.

Assuming values for Q_1 and Q_2, and this of course also fixes the value of Q_3, we lay off the pressure gradients for these rates of flow, beginning at D. It must not be forgotten, of course, that $Q_1 + Q_2 = 280$ must be satisfied when making these assumptions. It may be necessary to make several trials until the gradients all meet in a common point on the line at B. With the point B established, we proceed by drawing the gradient for 230 bbls. per hour from B toward A. The pressure scale at A then gives the gauge pressure which was to be determined.

Move Crude West From Atlantic

Texas Oil Being Piped to Franklin and Pittsburgh, Pa. New Business Aided Transportation Companies

By George Turnbull

A situation which early pipe liners could never have believed as possible is now a reality—crude oil is being moved westward from the Atlantic seaboard to two points in western Pennsylvania. The crude is from Texas, is shipped to the Gulf Coast in pipe lines, from there to the Philadelphia region in tank ships and then taken in charge by pipe lines again for the final leg of the shipment to the refineries. This move, which was inaugurated by the officials of the National Transit Co., has meant a great deal to certain of the pipe lines of the eastern division as it has provided a use for some of their lines which for many years have been idle.

This Texas crude is moving to two points, the Eclipse works of the Atlantic Refining Co. at Franklin, which is receiving in the neighborhood of 3,500 bbls. a day through this system, and the works of the Atlantic Refining Co. at Pittsburgh, which is securing about 3,000 bbls. daily through the same medium.

The first oil from Texas to be moved in this manner was sent through the pipe lines from the seaboard to Franklin in July, 1928. In this movement the Northern Pipe Line Co. was a participating company with the National Transit Co. Considerable changes had to be made in the lines and the pump stations to take care of this traffic and the idea was considered a revolutionary one at the time. It has now been in operation for more than a year and is proving very efficient. In June of this year the movement to the Atlantic at Pittsburgh was started and it also required considerable preparation on the part of the pipe line companies affected, the National Transit, the Northern Pipe Line Co., and the Southwest Pennsylvania Pipe Lines.

Pipe lines which once carried a tremendous business in crude sent from the Mid-Continent fields to refineries on the Atlantic seaboard had for several years prior to the starting of the western movement been idle. Tankers had taken over this trade and the pipe lines were facing a situation which had reduced their revenues in some cases to a minus quantity. The action of the National Transit and other systems involved in handling this Texas crude in this manner has provided the pipe line carriers involved with a source of revenue for what had previously been a nonpaying trunk line system.

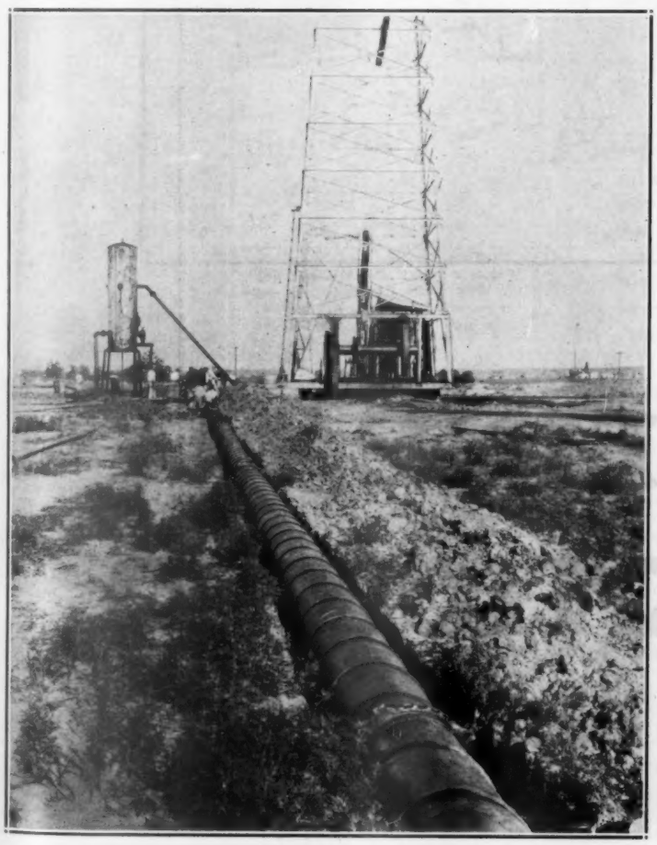
There have been other changes in traffic in the eastern area which have proven of great benefit to the National Transit system. The latter part of last year crude for the first time in history started to move through the National Transit system for the refineries of the Oil City and Warren district. Since that time this movement has steadily increased until now it is a substantial portion of the traffic of the National Transit. Leading oil men of this territory are firm in their belief that this change in the pipe line situation is all that saved the Bradford producers from a severe cut in their crude market this spring when production there started to grow by leaps and bounds. They point out that crude was piling up in the Bradford district fast at just the time when the Oil City and Warren refineries began to make heavy demands upon it by making use of the lines of the National Transit which had been changed to fit the situation.

Another innovation of the National Transit which is just now going into effect is the transportation of crude from the Cattaraugus, N. Y., district. The National Transit and the New York Transit posted a joint tariff for the handling of this oil from the State Line station, N. Y., to the Oil City, Warren and Emlenton district. The first New York state produced crude to be used in the Oil City refining district was run through the lines of the two pipe line companies during the first part of July this year.

Two sections of the eastern pipe line system have recently been sold by the pipe line companies to subsidiaries of the Columbia Gas & Electric Co. and it is believed that they will be used for the transportation of natural gas in the future. One is a part of the lines of the New York Transit Co. The other is one of the cross-state lines of the Southern Pipe Line Co.

The line of the Southern involved in the sale stretched from the western border of Pennsylvania entirely across the state and was sold to the Manufacturers Light and Heat Co. For it the Southern Pipe Line Co. received $100,000 in cash and a six months note at 5 per cent for the remainder of the purchase price, $855,056.

SPIRAL WELDED PIPE LINE EXTENDING FROM FIELD



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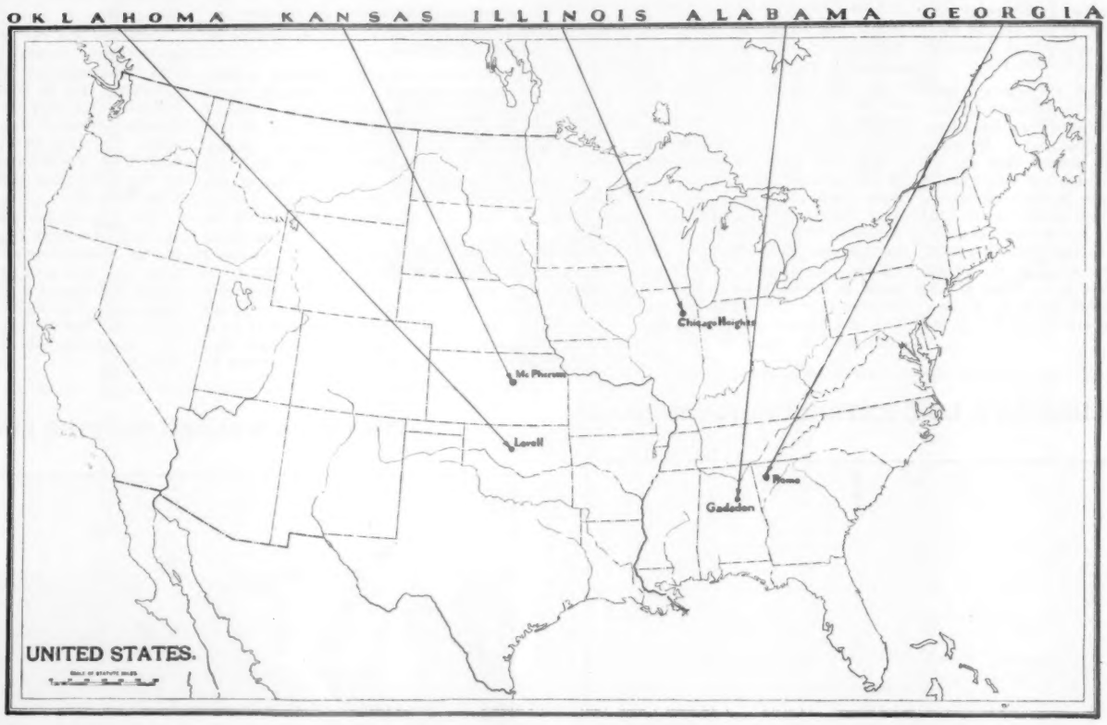

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Oil Loading and Unloading Terminals

Interesting Description of Gulf Coast Districts, Capacities, and Methods of Operation and Equipment

Prepared by Representative of Humble Pipe Line Co.

The past quarter of a century has seen the growth of oil loading and unloading terminals in the Gulf Coast area advance from a very insignificant beginning to the innumerable terminals of the present day standards, many of which rank with the largest in the world. The Gulf Coast area proper extends from New Orleans, La., to Corpus Christi, Tex., or a distance by boat direct of approximately 40 to 50 hours steaming time. It comprises not only ports located almost directly on the Gulf of Mexico, but those on numerous rivers, canals and channels which extend inland for some distance and have a total length of navigible water of between 450 and 500 miles, with channel depth ranging from 25 to 35 feet. The Gulf Coast area is divided into four main districts, which are Mississippi River district, Sabine district, Houston-Texas City-Galveston district, and the Corpus Christi district, and it is the purpose of this article to discuss briefly the districts separately beginning with the Mississippi River district.

Mississippi River District

This division of the Gulf Coast area comprises the Mississippi River, entrance to which is made from the Gulf of Mexico through several main passes approximately 110 miles southeast of New Orleans, and there are to be found along its meandering course a number of oil terminals, the largest of which in this area is approximately 250 miles from the Gulf. The river has a depth of 35 feet at low stage, extending more than 300 miles from where it empties into the sea.

This natural channel of the "Father of Waters" offers safe navigation for even the largest of tank ships afloat, and possessing the advantages of an inland harbor, made possible the selection of sites for oil terminals, refineries, etc., some of which had their beginning as far back as 1908 and 1910, when oil fields were discovered and developed in northern Louisiana. Later, with the extension of fields in Louisiana and discovery of oil in Arkansas, together with the increased demands by foreign and domestic needs for petroleum and its products, it was only natural that great development would be made along the waterways of the Mississippi River, and as a consequence today the number and capacity of plants located along the Mississippi River channel contribute very substantially to the total tonnage of this port area.

Discussion of Terminals

On entering the channel from the Gulf of Mexico, the first terminal to be seen is that of the Sinclair Oil & Refining Co. at Mereaux, La., approximately 8 miles from New Orleans. Then at Amesville, La., The Texas Company has a small floating, or pontoon, dock used chiefly for refined oils. At Avondale, 121 miles from sea, the Standard Oil Co. of Louisiana has a small wharf over which fuel and crude oil is handled, and is principally used for barge service. At St. Roe, La., 135 miles from the Gulf, is the terminal belonging to the Carson Petroleum Co. Next comes the Mexican Petroleum Co. at Destrahan, 133 miles from the sea, which is used for handling both crude and refined products. At Sellers, La., there are two terminals, one belonging to the General American Tank & Storage Co., used for handling gasoline and crude; the other to the Shell Petroleum Corp., formerly the New Orleans Refining Co., over which crude and different kinds of refined products are loaded. The next and largest terminal in this district is that of the Standard Oil Co. of Louisiana, located at Baton Rouge, a distance of approximately 247 miles from the Gulf of Mexico, and is the main terminal of that company, being used for crude and all refined products in transporting to eastern and foreign markets, as well as by barges up the Mississippi River for interior distribution.

The hourly loading rates of the different oil terminals in this district vary from 4,000 to 20,000 bbls. per hour, but for the entire district the average loading per hour for crude is 57,800 bbls., and for refined oils 53,700 bbls., totaling 111,500 bbls. per hour, with berthing capacity for 12 ships and having an average loading rate per hour per berth of 9,291 bbls.

Sabine District

In the early part of 1901 the bringing in of the "Lucas gusher" at Spindletop marked the beginning of history in the development of oil fields in the Gulf Coast area. This well and surrounding development was located not a long way from two well-known navigable waterways. These rivers, the Neches and Sabine, emptying into Sabine Lake near Port Arthur, then through the present Sabine-Port Arthur Canal to the Gulf, were naturally looked upon with favor by the oil companies in seeking locations for their refineries, terminals, etc., and today there are to be found in this district three of the largest plants in the Gulf Coast area. Development in this area has had rapid progress in the past quarter of a century, which can be greatly attributed to the number of oil fields discovered throughout that time in the Gulf Coast area, as well as extensions into Northern and Western Texas and Oklahoma. Unlike the Mississippi River district, the terminals in this area are all located within a comparatively short distance of the Gulf of Mexico or open sea. This area is entered from the Gulf of Mexico through Sabine Pass and the first large terminal on this waterway is that of The Texas Company, located on the Sabine-Port Arthur Canal, approximately 14 miles from Sabine sea buoy. Over this terminal is loaded both crude and miscellaneous refined products, including package goods.

Leaving the main channel of the Port Arthur Canal, and going a short distance through a dredged canal, is found the main terminal and refinery of the Gulf Refining Co., over which crude and refined products are handled. This terminal is approximately 18 miles from the Gulf. The Atlantic Pipe Line Co. at Atreco, which is 31 miles from the sea, on the Neches River, is the fastest loading terminal in the Sabine district, loading crude oil at the rate of approximately 20,000 bbls. per hour. The Atlantic has two docks at this terminal, and loads both crude and refined oils. At Magpetco, approximately 6 miles above Atreco, the Magnolia Petroleum Co. has a terminal used for loading crude and refined products. The plant of the Pure Oil Co., located at Smith's Bluff, 37 miles from Sabine sea buoy, is used for loading crude and refined products. At Beaumont, on the Neches River, are found two large terminals, one belonging to the Yount Lee Oil Co., approximately 42 miles from sea, and used exclusively in the loading of crude oil. Seven miles farther up the Neches River is found the main refinery and terminal of the Magnolia Petroleum Co., which like the terminals of The Texas Company and the Gulf handle crude as well as all by-products.

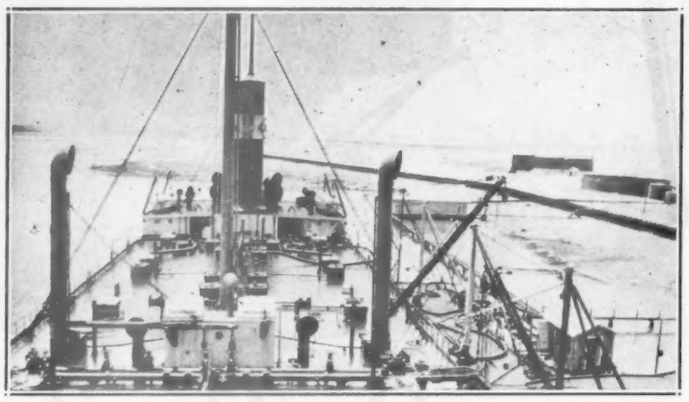
At the intersection of the Neches River with the Sabine-Neches Canal is found a small crude oil loading terminal of the Humble Oil & Refining Co. Going farther on through the Sabine-Neches Canal into the Sabine River, a short way southeast down to Orange, and then through the Calcasieu Parish and Navigation Canal into the Calcasieu River to Lockport, La., a distance from sea of approximately 72 miles, is found the crude oil loading terminal of the Vacuum Oil Co., which has 30 feet of water to the sea. This terminal was built to take care of the Vacuum crude oil production in the Lockport Field.

The terminals in this district have an hourly loading capacity of crude varying from 5,000 to 20,000 bbls. per hour depending upon conditions. The combined loading rate per hour in this district is 89,000 bbls. for crude and 70,000 bbls. for refined oil, making a total of 159,000 bbls. per hour. There are 27 berths in this district, with an average loading rate per berth of 5,900 bbls. per hour.

Houston-Texas City-Galveston District

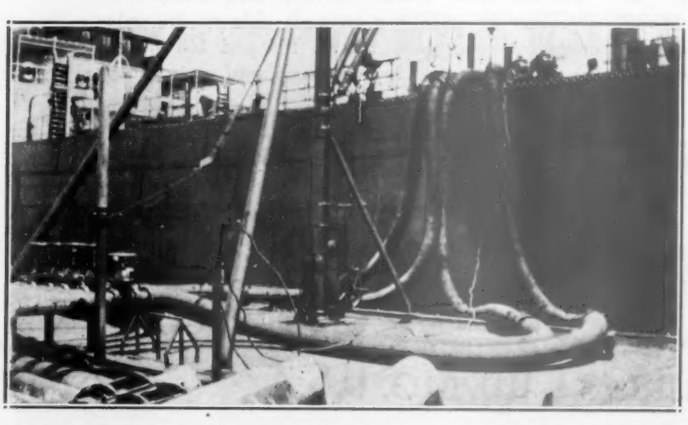
The Galveston-Texas City ports rank among the oldest in the United States, located on the Galveston Bay in close proximity to the Gulf of Mexico through its entrance by way of Bolivar Roads. It was naturally looked upon by companies seeking oil terminal locations as being accessible to the handling of oils from Mexico, as well as serving the Gulf Coast oil field, and in this area a number of large oil terminals are located.

Extension of navigable waterways for ocean-going steamers has made rapid progress in recent years in the developing of what is now known as the Houston Ship Channel, which development was occasioned by the fact that Buffalo Bayou, winding its way through the heart of the city of Houston, and combining with the San Jacinto River near Lynchburg, Tex., thence to the Gulf through Galveston Bay, made possible the present Houston Ship Channel, which now has an average depth of 30 feet of water from the city of Houston to open sea. The fact that a channel of suitable depth



Deck view of modern oil tanker. The white house in center of ship covers the pump room. The ship's pumps are located on the bottom of the boat about 35 feet below the deck.

Typical oil loading terminal layout.



Hose connections to one of the large tankers. These are 8-inch rubber hose. Note the hose handling derrick and also the static bonding wire.

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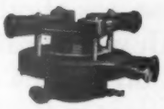

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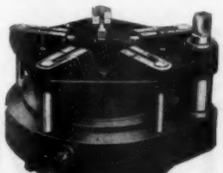

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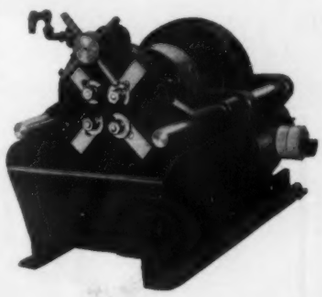

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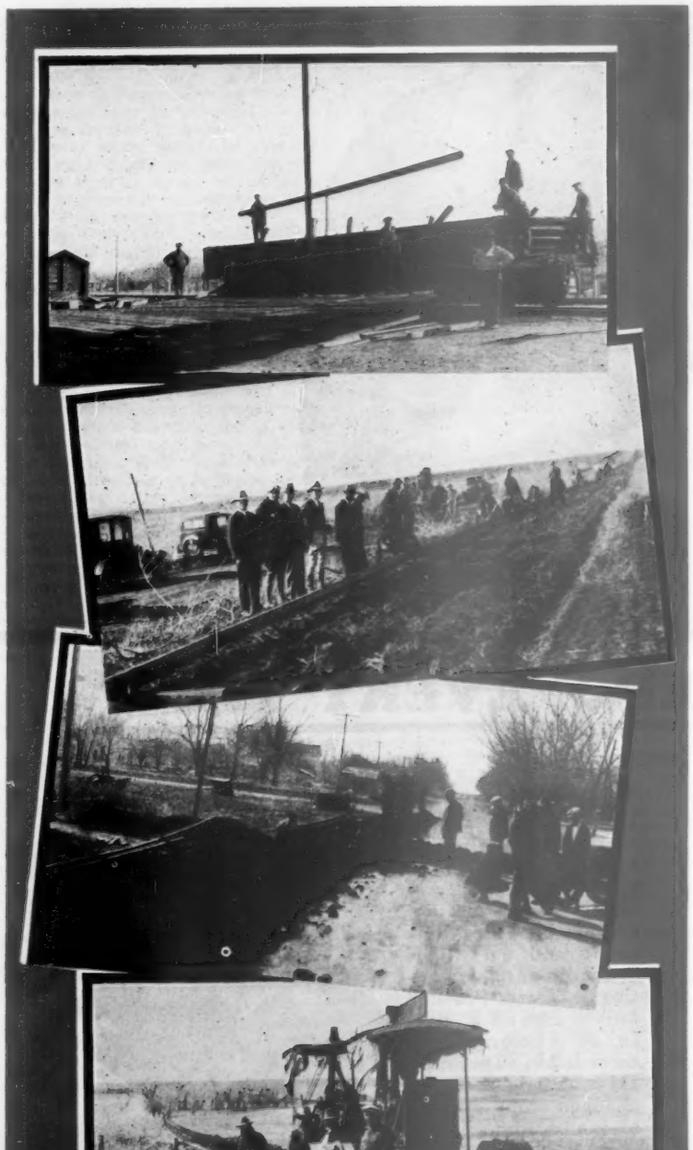

With the Western Gas Company's natural gas line under construction in Central Kansas.

The Western Gas Company, in bringing natural gas from Kansas gas fields to thousands of homes, business buildings, industries and institutions in Central Kansas accomplished a wonderful feat. In describing this feat to the public, their opinion of the part Truman-Smith played is expressed as follows:

> *"Next was the matter of choosing a contractor to build the system. The contract was awarded to Truman and Smith Construction Co. of El Dorado, Kansas, who have a splendid record of success in the execution of large similar projects for some of the largest concerns in the gas and oil business. Our selection of this firm proved fully justified by events to follow, for all through the progress of the work there has been evident an earnest effort to do the job well and in the least possible time."*

The impression received by the Western Gas Company of Truman-Smith's sincerity of work is the same impression scores of others have received. Truman-Smith would rather lose a contract than accept it on figures that would not allow a finished project in the best possible condition—ready for use in the time specified.

The
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for ocean-going vessels was offered by the Houston Ship Channel, combined with the discovery and development over the past few years of oil fields in Central, North and West Texas, has contributed greatly to the oil terminal development by the newer companies and some of the older companies operating in this area, and entering the Port area from the Gulf of Mexico through Bolivar Roads, it is interesting to note the number and size of refineries and terminals located in this area.

Approximately 8 miles from Bolivar Roads, and located at Texas City on Galveston Bay in close proximity to each other, are found the terminals of the Humble Oil & Refining Co., the Pierce Petroleum Corp., the Vacuum Oil Co., Marland Oil Co. and Swiftsure Petroleum Co., over which crude, chiefly, and some refined products are handled, with loading rates ranging from 4,500 to 18,000 bbls. per hour. Located on the Houston Ship Channel, at Baytown, Tex., approximately 28 miles from Bolivar Roads, is found the main refinery and loading terminal of the Humble Oil & Refining Co., which handles both crude and miscellaneous refined products.

A 15,000-ton, 120,000-bbl. tank steamer making dock at refinery. The dock is constructed of concrete.

Approximately 8 miles up the channel, at Lynchburg, Tex., is found a small crude oil loading and bunkering dock belonging to the Gulf Refining Co. The Shell Petroleum Corp. is in process of building its main refinery and terminal for this area at a point on the Houston Ship Channel approximately 42 miles from Bolivar Roads, which is near the town of Deer Park, Tex., over which it will handle both crude and refined products on completion of the plant in the near future.

The Texas Company (formerly Galena Signal Oil Co.), has two docks located on the Houston Ship Channel, 44 and 46 miles from Bolivar Roads, over which crude and refined products are loaded, located at Norsworthy and Pasadena, respectively. Two miles farther north, on the Houston Ship Channel, is the refinery and terminal belonging to the Crown Central Petroleum Co., also located near the town of Pasadena, while 1 mile farther north is the main refinery and terminal of the Sinclair Refining Co., located near the town of Pasadena, over which crude and miscellaneous refined products are handled. The last refinery to be found on the Houston Ship Channel is that of the Deepwater refinery located approximately 50 miles from Bolivar Roads, Galveston, which handles both crude and refined products.

The hourly loading rates of the different terminals located in this area for crude vary from 4,500 to 20,000 bbls. and for refined oils depends upon conditions. The total hourly loading rate for the district is the largest of any in this area. For instance, for crude oil it is 105,500 bbls. per hour, refined oils 89,000 bbls. per hour, making a total of 194,500 bbls. per hour, with a berthing capacity for 25 ships, or an average per berth of 7,780 bbls. per hour.

Corpus Christi District

This is the newest port district in the Gulf Coast area. Entrance is made through Aransas Pass, Tex., then into the channel across Corpus Christi Bay to Corpus Christi, Tex. From the pass approximately 2 miles up the channel there is a water depth of 31 feet. From this point up the channel to Corpus Christi there is maintained a depth of 25 feet.

The discovery and development of oil in the Mirando and Laredo districts in Southwest Texas contributed to the present activities in this district. However, there were, years ago, and especially during the World War, several small unloading and loading terminals located on Harbor Island that were used principally for handling shipments of Mexican oils. These terminals at the present time are used for bunkering, and also used for handling crude from the Mirando and Refugio Fields.

Later, extensions were made in the West Texas fields which made possible refinery locations and larger terminal facilities. This district offers the shortest route to the West Texas fields. Two miles from the bar at Aransas Pass on Harbor Island is located the main crude terminal of the Humble Pipe Line Co., which has the largest hourly rate of loading of any oil terminal in the Gulf Coast area. Approximately 9 miles up the Corpus Christi channel, near Ingleside, Tex., is the original terminal of the Humble Oil & Refining Co., originally used for loading crude from the Mirando district, and now used for handling small crude cargoes, but principally refined products from this company's Ingleside refinery. The terminal belonging to the Humble Pipe Line Co. at Harbor Island has berthing space for two ships, and a record average loading rate of 26,000 bbls. per hour has been established at this terminal. The plant belonging to the Humble Oil & Refining Co. at Ingleside has an average loading rate for crude of 15,000 bbls. per hour. Although this port contains the smallest number of oil loading terminals, yet the hourly rate exceeds that of any in the entire Gulf Coast district. The loading rate for crude oil is 55,200 bbls. per hour, refined oils, 8,000 bbls. per hour, making a total of 63,200 bbls. per hour, with berthing capacity for four ships, and an average loading rate per berth of 15,800 bbls. per hour.

In summing up the loading rates of the four districts in this area, it is found that the capacity for crude is 307,500 bbls. per hour, and for refined oils 220,000 bbls. per hour, making a total possible loading rate of 527,000 bbls. per hour, or at a continuous run per day of 24 hours the terminals in the Gulf Coast area proper could handle approximately 13,000,000 bbls. of oil, both refined and crude, with a total of 80 berths, averaging 6,000 bbls. per hour per berth. With this rate of continuous loading it would require in round numbers 158 tank ships with an average capacity of 80,000 bbls. each.

It would not be amiss to outline in a general way the typical layouts of oil terminals in the Gulf Coast area, type of equipment used, and certain other details, all of which in their entirety may not be much different from typical loading terminals in other areas, yet there no doubt are some particular features of design or problems to overcome in the Gulf Coast area which are not generally met with in other parts of the country.

Dock Design

There are many different types of docks in this area used for loading oil. All the docks at the crude oil loading terminals are of creosoted timber construction, and usually have fender protection in front of the face of the dock. The usual fender protection consists of dolphin fenders spaced approximately 50 feet apart and extending the length of and from 3 to 6 feet in front of the dock. However, several unique fender systems have been added to the later docks constructed in this area. Two of the docks in the Corpus Christi area are protected by a row of fender piling extending the entire length of the dock approximately 7 feet from the main structure and composed of one straight and two batter pilings at each bent of the main structure. These pilings are tied together with waling strips, both on the face of and behind the fender. The fender system on these docks has been in operation approximately one year and has proved to be very satisfactory. The Shell Corp. has recently completed a dock at Deer Park of similar construction, but has added features of protection, one of which is the spring fender system, which allows piling with heavy wooden wales to spring in a clear space of about 6 feet from the face of the dock, so that a ship may bump the fender with considerable force with no shock on the dock iself.

The picture of this dock shows the detail of this construction.

A deciding factor in the use of this fender system on some of the recently constructed docks was the necessity for eliminating oil spillage into navigable waters. These docks being of timber construction, it was necessary to lay the decking of the dock with tonnage and groove lumber and properly caulk and seal same so that any oil spillage on the dock should be carried ashore to tanks and sumps which are provided for the purpose. It was therefore necessary to build this protection in front of the dock strong enough to ward vessels off from it, as the working of the dock by vessels taking up against it would cause leakage.

The majority of the timber constructed docks are of short length, being only long enough to take care of the cargo connections and hose necessary for connecting vessels. Dolphins are placed at either end of these docks for the vessels to rest against. In addition to the dolphins at each end, fender dolphins are located in front of the dock, as previously described, and mooring dolphins are placed at either end and back of the dock for making fast the ship's lines. Usually cleats and bits are placed on the wharf located in front of the apron of the dock for handling the ship's spring lines. At most terminals small motor boats or light launches are used for taking the ship's lines from the vessels to the mooring docks.

The majority of the docks at the refineries in this area are of concrete construction, and so constructed that any oil spilled on the deck of the dock is carried into drain lines and ashore into sumps or slop tanks. Cargo lines are usually laid on stringers on the back side of apron of the dock, and risers for cargo hose are placed approximately 50 feet apart on these cargo lines to facilitate the connecting of cargo hose to the ship's cargo connections at as many places as are necessary. Dock hose handling derricks with suitable hooks and with hand, steam, air, or electrically operated winches are located in front of the cargo connections to handle the hose from the dock to the ship.

Design of Station Equipment, Tankage and Lines

Oil loading terminals in this area are in many cases on low marshy ground at or near sea level, and in order to safeguard against overflows, heavy tides, etc., it has been found necessary in dredging slips alongside the docks to throw the spoil on proposed station site, filling in to an elevation well above sea level. This requires the use of expensive bulkheads of sheet piling, usually of the creosoted timber type. These conditions are attended by certain problems which must be overcome for safe design. For instance, if the spoil from the slips is of some unstable soil, such as different types of clay, decayed vegetation, etc., it is almost impossible to erect large tanks and station buildings on such foundation unless time permits the complete drainage of the water from the fill before erection is started. If the spoil from the slips, however, contains sand, the water easily and quickly drains from this type of fill, and within a reasonably short period of time foundations can be satisfactorily made for tankage, station buildings, etc.

In the selection and laying out of tanks for oil terminals, the bearing of soils has to be taken into consideration to determine whether the tanks should be placed on piling, or whether to secure large diameter tanks with lower heights, or whether the fill will stand the standard design steel storage tanks which are

Showing in detail fender construction of Shell Petroleum Corp.'s dock at Deer Park on Houston Ship Channel.

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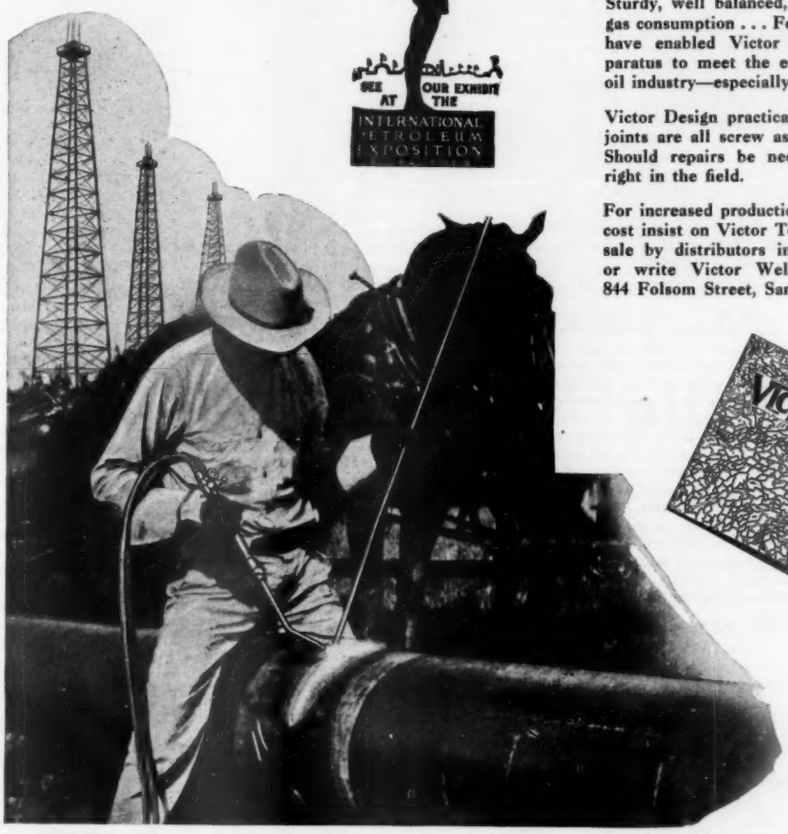

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generally used by the oil industry. It is most desirable in laying out terminal equipment to place tankage, pump stations and accessories as close to the docks as is practical, as this makes short suction and discharge from pumps to tanks and docks, which materially governs the selection of the proper loading equipment, as it reduces the loss of head due to friction in lines when carrying the large capacity rates per hour which the average loading terminals are required to handle.

Due to the high rate of loading per hour required at the average loading terminal, it is most desirable, not only from the standpoint of the cost of initial investment, but from the standpoint of subsequent operating costs, regardless of whether steam or electricity is used, that low head pumps of large capacity be used rather than small pumps of high head, and, therefore, at the greater majority of terminals in this area larger capacity and relatively low head pumps are to be found. There are a number of steam pumps of the piston pattern type in operation at some of the smaller docks, and in some cases at even the larger docks, where the heavier crudes or fuel oils are handled, but the motor driven centrifugal pump of large capacity and low head is the type most generally used for loading of the average crude from fields feeding this area, as this type of pump, of capacities up to 15,000 bbls. per. hour each, with operating pressures around 40 to 50 pounds can be got considerably cheaper than for a larger number of smaller pumps at higher head, whether of the piston pattern type or centrifugal. These centrifugal pumps of low head are generally the single-stage, double-suction type, which when handling the average Mid-Continent crude have a very good efficiency.

Another deciding factor in this type of pump is that of the small amount of space required for pumphouse designed for large loading capacity. For instance, the writer has in mind one pumphouse equipped with four pumps, having a total of 30,000 bbls. loading rate per hour, in which pumps are separated from the motors by gas-proof fire walls which are housed by a building with outside dimensions of 23 feet by 73 feet.

The use of centrifugal pumps on the more viscous oils, either crude or fuel, is not generally made, as the efficiencies of these pumps fall off materially in the handling of such liquids, and at terminals where this type of oil is to be handled it is preferable to use either rotary pumps or piston pattern pumps, either steam or electrically driven.

Another deciding factor in the selection of centrifugal pumps for loading service is the fact that the discharge gate can be closed off against the pump without in any way endangering the equipment or lines. This is frequently necessary, especially at the terminals where a high rate of loading is maintained. In such cases, when a ship's tanks are nearing the capacity for which they are designed, the ship's crew will not hesitate to close valves directly against the stream in order to eliminate danger of running tanks over.

The layout of lines to adequately equip a terminal for high hourly loading rates requires either a large number of smaller lines, such as 8, 10 and 12-inch, or a fewer number of large lines, 16 to 24 inches, especially on the suction side, as it has been found that the cost under ordinary conditions of the larger suction lines is but very little more than that of the smaller lines, and at the same time, the larger lines give much more efficient feed to the pumps than would the system of smaller lines. This is an especially important factor when using centrifugal pumps. The discharge lines from pumps to loading docks, of course, depend upon the distance from pumphouse to docks, the loading rates required, and the most economical operating pressure desired to place on the pumps.

Fire Protection

Due to the fast loading rates required at the average terminal, as well as many other conditions surrounding a station of this type, there are great fire hazards, and the majority of companies at their main loading terminals feel that the best and most practical, however elaborate, fire protection system available is the cheapest insurance in the long run. Some of the larger docks, especially those adjacent to refineries where steam in large quantities is available, are equipped with steam lines on the docks, as well as water and foamite. Where steam is not available in sufficient quantities, some standard foam system is installed for entire protection of docks, station buildings and tankage.

Oil Pipe Line Systems of Rumania

No Common Carriers and No Independent Systems, Resulting in a Great Number of Private Lines

By J. T. Hayward
Consulting Engineer, Tulsa

As this is probably the first time that a description of the Rumanian pipe lines has appeared in English, it is thought advisable to include a certain amount of historical matter.

For convenience the narration may be divided into two sections, i.e., the privately owned crude lines between the producing fields and the refineries, and the state owned lines for transporting refined products from the refinery centers to the ports.

An important point in connection with the figures given should be borne in mind. It is that all liquid measurements in the Rumanian petroleum industry are based upon weight, not volume. It is therefore impossible to convert the figures for annual production, to give an example, into American units because the weighted average density is not known. Some serious mistakes in plant specifications have been made owing to lack of appreciation of this matter.

Referring now to the crude pipe lines. Compared with American conditions these are on a very small scale. The total crude oil production of the country amounts to about 110,000 bbls. per day. The export of crude oil is prohibited and over 80 per cent of the crude produced is refined at the town of Ploesti and another 10 per cent at Campina, a town 20 miles distant. The production lies around the above two towns, over 90 per cent of it being within 20 miles of them. The fields are in the foothills while the above mentioned refining centers are on the plains several hundred feet below. The geographical conditions are therefore ideal. It will be easily understood why these crude oil lines are small and present little of importance from the engineering point of view.

No Common Carriers

There are no common carriers and no independent pipe line systems, the major companies each having its private network of lines connecting all its producing properties with its own refinery. This is of course an inefficient arrangement, leading to a great number of lines where one or two would serve, pumping stations, etc., being of course duplicated accordingly. To give a concrete example. The production of the principal field—Moreni—Gura Acnitea is around 30,000 bbls. per day and this field is connected to the two refinery centers by no less than 15 separate lines, each with its own pumping stations, tanks, telephone system, management, etc. A list of these lines is as follows:

	No. of lines	Internal diameter
	7	6"
	1	5" & 6"
	1	5"
	1	5" & 4"
	4	4"
	1	3½"
Total number of lines ..	15	

from which it will be seen how small many of them are.

Pipe line tank farms may be said to be about nonexistent, the tanks consisting of little more than gathering tanks on the fields and crude storage tanks in the refineries. The total crude in storage in the county averages around 2,000,000 bbls., equivalent to 18 days' production.

The following table shows the total length of crude oil pipe line owned by each of the principal companies:

Name of company—	Total length of crude oil pipe line owned miles
Concordia	176
Steau Romana	170
Astra Romana (Shell)	155
Unirea (Phoenix)	132
Romana Americana (S. O.)	114
Aquila Franco Romana	74
I. R. D. P.	41
Sospiro	33
Various other lines	135
Total	1,030

Crude Hard to Handle

A certain difficulty in pipe line operation has made its appearance during the last few years and is causing constantly increasing trouble. This is the high congealing point (30 to 50 degrees Fahrenheit) of the deeper Meotic paraffin base crudes and these crudes compose an increasing proportion of the production. During the winter months the temperature falls below zero Fahrenheit for considerable periods and pumping pressures of 1,000 pounds per square inch for weeks on end are met with on 5-inch and 6-inch lines of 10 to 20 miles in length. Complete stoppages are not infrequent and when these occur there is often nothing to do but pull the line up, clean it joint by joint and relay. The plugging appears to be caused by the building up of paraffin wax on the walls of the pipe decreasing the diameter and throughput. At any time a small object or a lump of the paraffin itself may start to travel along and collect and drive a plug ahead of it, soon leading to complete stoppage. After this has occurred and even when it is possible to wait for the hot weather, it is impossible to clear the line by pumping as the paraffin collected has a much higher congealing point than that of the original crude. Various expedients are being tried, such as preheating the oil to 100 to 200 degrees Fahrenheit, mixing with asphalt base oils where these are available, or with gas oil pumped back from the refineries to the fields for the purpose.

To begin with, the preheating was done in the field tanks but this not only destroyed the value of the oil by driving off the light ends but actually aggravated the pumping trouble owing to the loss of these light ends lowering the congealing point. More recently the heating has been done by steam to crude heaters placed on the pressure side of the pumps. Homemade exchangers are common but high pressure multitubular heat exchangers of American manufacture are rapidly gaining favor. It cannot be said yet that the trouble has been overcome. Even when inlet temperatures and rates of pumping are such that the oil arrives at the receiving station comparatively warm, the building up of paraffin on the pipe walls still appears to take place, probably in a manner similar to that in which ice will form on a cold pipe in a hot room.

Turning now to the second section of the pipe line system, namely, the government owned pipe lines for refined products between the refining center and the ports. As previously mentioned, the export of crude oil is prohibited and it has therefore all to be refined in the country. The internal consumption is about 30 per cent, leaving 70 per cent to be exported. Most of this is done through the salt water Black Sea port of Constanta, and the rest through the Danube port Giurgiu. The latter supplies the upriver markets of Central Europe but has the disadvantage of being blocked by ice during three or four months out of the year.

The distance from the refineries to Constanta is 200 miles and to Giurgiu 80 miles. Most of the railway is single track, the tank cars are small, usually under 100 bbls., and the complete absence of automatic brakes necessitates comparatively short trains. Constant difficulty has therefore been experienced in moving the exportable surplus.

In 1912, a government commission was appointed and it was decided to lay a 10-inch and two 5-inch pipe lines from Baicoi, a place between Ploesti and Campina to Constanta, a distance of 210 miles. The 10-inch line was intended for crude oil and the 5-inch lines for lamp oil. The oil companies were to be encouraged to move their refineries to the seaboard at Constanta and were to be financially assisted by the government to do so. There were 600 miles of pipe for these lines ordered in America and an American crew headed by W. T. Cushing went to Rumania to supervise the construction. The pipe was delivered, long sections were laid and the pump stations partly built when the war intervened and subsequent occupation of the country by the enemy put a complete stop to the scheme. After the war it was found that the lines had to a large extent been pulled up and the auxiliary works destroyed as shipment to the Black Sea was of no interest or use to the central powers. The 5-inch pipe had been used to construct a couple of lines to Giurgiu which would enable what small production there was, after the very efficient destruction of the industry during the retreat, to be shipped up the Danube to Germany where it was sorely needed.

Present Situation

The present situation is as follows: Of the two 5-inch lines to Giurgiu, one is used for refined products and has a capacity of about 3,000 bbls. per day and the other is used for certain grades of fuel oil that can be pumped and exported, and also for small quantities of crude to supply a couple of small refineries situated on the Danube. The capacity of the latter line is about 2,000 bbls. per day. The length of each of these lines, as already stated, is about 80 miles. There is also a 5-inch line to Bucharesti used for supplying fuel oil to that town and crude oil to a small refinery near it. This line is about 40 miles in length. The 210-mile 10-inch pipe line to Constanta has been repaired and is used for lamp oil. As there are no intermediate pumping stations in the whole 210 miles, the daily capacity is very small—about 8,000 bbls. per day, although the material pumped is lamp oil and the line has a falling gradient. The total length of these government owned lines is about 450 miles.

A new 8-inch line from Ploesti to Constanta is at present under consideration and the pumping station at Ploesti is being enlarged and reconstructed.

The quantities pumped through the government owned lines during 1927 and 1928 were approximately as follows:

Pipe line—	Quantity pumped 1927 bbls.	1928 bbls.	Kind of material
10" Baicoi-Constanta	2,000,000	2,800,000	A
5" Baicoi-Bucharesti	700,000	680,000	B
5" Baicoi-Giurgiu ..	440,000	530,000	C
5" Baicoi-Giurgiu ..	780,000	840,000	D

A—Lamp oil. B—Fuel and crude. C—Mazout. D—Fuel and crude oil.

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DRAWN FOR WESTINGHOUSE BY C. PETER HELCK

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Selection of Motors for Pipe Lines

Large Number of Factors Enter Into Problem of Most Economical Operation. All Phases Must Be Considered

By L. J. Murphy
General Engineer, Westinghouse Electric & Manufacturing Co.

In the application of motors to pipe line pumps there are a large number of factors entering into the selection of the type of motor which will give the most economical operation. All phases of the problem must be considered and estimated future operating conditions will be of vital importance in the final analysis. If the quantity of oil to be handled remains constant over a period of years, then the problem becomes a comparatively simple one, but, unfortunately, the majority of pipelines do not operate in this manner. Electrical equipment which will give the lowest cost per barrel over a period of years and under all probable conditions of loading, is then the one which should be chosen.

Both centrifugal and plunger type pumps are commonly employed in pipeline work, and both are adaptable to motor drives, although in the last three or four years there has been an ever increasing proportion of the total number of pumps of the centrifugal type, due principally to their low first cost, a factor of vital importance where the life of the line is problematical. For these reasons this article is limited to the application of motors to the centrifugal type of pump. Much credit is due the pump manufacturers for realizing and overcoming many difficult problems of centrifugal pump design for pipeline work.

Sufficient Torque

Any type of motor, whether it be squirrel cage, wound rotor or synchronous, can be applied to centrifugal pumps, and will bring the pump up to speed regardless of whether the discharge valve is open or closed. The only requirements are that the motor have sufficient torque at any speed to overcome the torque required by the pump at that same speed.

Figure 1 illustrates the acceleration of a centrifugal pump using a squirrel cage motor as the driving medium and applying 65 per cent of normal voltage to bring the pump partially up to speed. It will be readily understood that the excess torque of the motor above that required for the pump is used for accelerating purposes, and that, as soon as the torque of motor and the torque of the pump become equal, there is no further increase in speed. It is further evident that if the discharge valve of the pump is closed, the pump will come up to speed in the shortest possible period of time, and that the condition of pumping oil into an empty pipe line represents the worst accelerating condition to be overcome. If there is a check valve in the line the first portion of the period of acceleration is equivalent to a condition of a closed discharge valve, and, as soon as the head developed by the pump exceeds the static head of the oil in the pipe line, then the torque required by the pump increases rapidly up to full load torque.

Squirrel Cage Motor

The squirrel cage motor is the least expensive, simplest and most rugged type, and for these reasons it often finds favor among the pipeline operators. Its power factor is fairly high, being above 90 per cent at full load for those ratings and speeds of motors normally used in this service. It has no wearing parts other than the two bearings and, on account of the absence of any sparking parts, such as brushes, commutators and collector rings, the possible fire hazard is reduced to a minimum. A typical installation of a number of 250 h.p. squirrel cage motors in pipeline service is shown in Figure 2.

The synchronous motor, when applied to centrifugal pumps in pipe line pumping, is usually installed with a direct connected exciter for each motor. All such machines are usually 100 per cent power factor motors because of the fact that the pipe line station is seldom in the vicinity of any low power factor load for which they could furnish power factor correction. There are cases, however, where such power factor correction would be needed, and if so, it would be less expensive to incorporate this correction in the motor rather than by installing other power factor correcting devices. Because of the fact that the losses in rotor are small as compared to the rotor losses in the squirrel cage motor, the synchronous machine is inherently more efficient, usually about 2 per cent higher. The air gap of this machine is from two to three times as great as that of the induction motor, which is an item of some importance from a bearing maintenance standpoint. The principal objection to the synchronous motor is the fact that its initial cost is approximately 40 per cent higher than that of the squirrel cage motor.

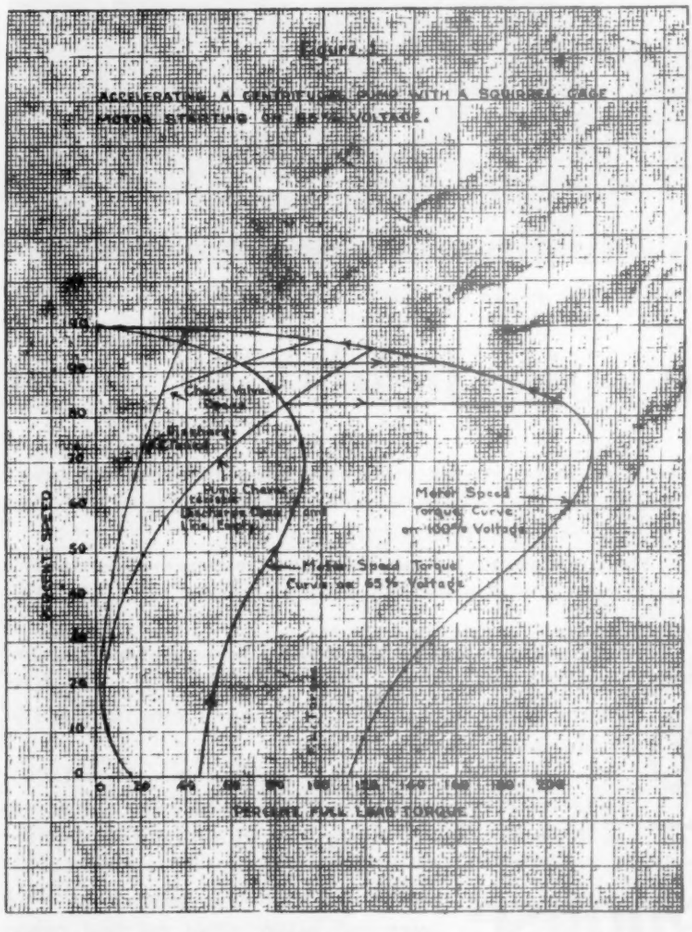
Figure 1
ACCELERATING A CENTRIFUGAL PUMP WITH A SQUIRREL CAGE MOTOR STARTING ON 65% VOLTAGE.
Check Valve Closed
Discharge Valve Open
Motor Speed Torque Curve on 100% Voltage
Motor Speed Torque Curve on 65% Voltage
PERCENT FULL LOAD TORQUE

Figure 1—Curve showing acceleration of a centrifugal pump by a squirrel cage motor starting on 65 per cent normal voltage.

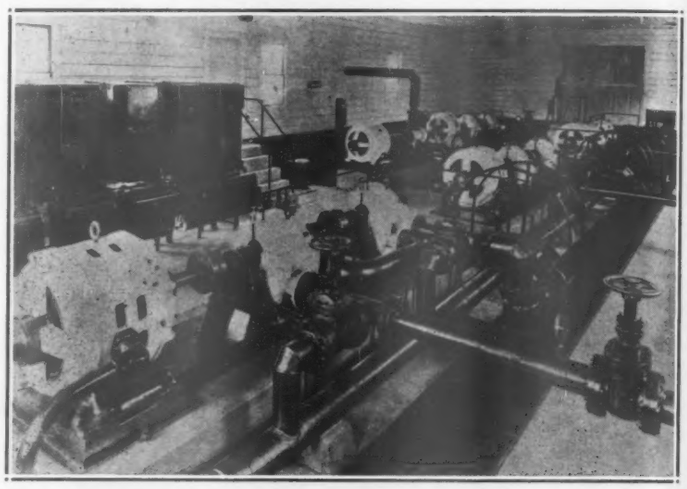

Figure 2—Typical installation of a number of 250-horsepower squirrel cage motors driving centrifugal pipe line pump

Figure 3 shows a typical installation of two 400 h.p. synchronous and direct connected exciters driving centrifugal pumps in pipe line pumping service. The fire wall, between the motor room and the pump room, with the built-in stuffing box through which the motor shaft passes, furnishes adequate protection against fire hazard.

Wound rotor motors have not to date been utilized for driving centrifugal pumps, and it is hardly likely that they

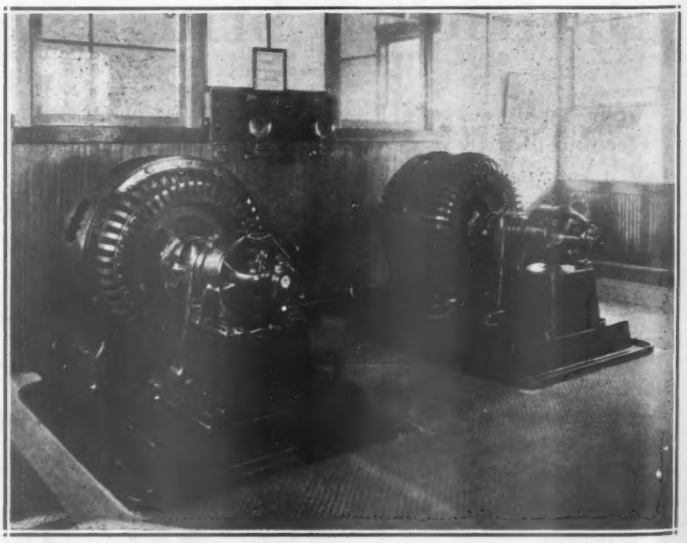

Figure 3—Installation of two 400-horsepower, 1,800 revolutions per minute synchronous motors driving pipe line pump. Note the fire wall between the motors and the pump.

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will be, as more economical methods can be found to operate the line at reduced capacity. The wound rotor induction motor is considerably more expensive than the squirrel cage type, is lower in efficiency, due to losses in the slip rings and brushes, and is likely to have slightly higher maintenance because of the fact that the relatively high secondary current must be carried by the brushes and collector rings. Its initial cost is comparable to that of the synchronous motor.

All these features of the different types of motors, their first cost, their relative efficiencies and power factors, their maintenance and their reliability in service, have an important bearing on the choice of motor equipment. There are, however, the other very important factors, such as the percentage of time the pump will operate at reduced capacity, and the nature of the contract of the central station supplying power, which will have a great influence in the proper selection. These last named factors are often of more importance than the motor characteristics.

A centrifugal pump is so designed that at or near its normal capacity it is operating at maximum efficiency. When operating below this capacity, either by throttling down the discharge valve or because the head required at that section of the line is in excess of the normal head of the pump, the efficiency drops off appreciably. The result is that for lower pump capacities, the brake horsepower required does not drop off in the same ratio. If, however, some means were provided for economically reducing the speed of the pump as the capacity is reduced, the efficiency can be maintained at a fairly high figure. Figure 4 illustrates the percentage of normal brake horsepower required to operate a centrifgual pipe line pump at reduced capacity, both by throttling the pump and by operating it at reduced speed. The two curves show a decided difference in power requirements in favor of operating at reduced speeds. It will be noticed that for this particular pump a reduction of 35 per cent in the output of the pump means only a reduction of approximately 15 per cent in the brake horsepower required to drive it. By reducing the speed to obtain the 35 per cent reduction pump output, the brake horsepower is reduced approximately 70 per cent.

Alternating and Direct Currents

Unfortunately there are no inexpensive and reliable types of alternating current motors which will operate efficiently at reduced speeds. Direct current motors, while operating efficiently over a considerable range of speed, require a motor generator set to furnish them with power, resulting in a high initial investment. Furthermore, on account of the losses in the motor generator set, the over-all efficiency of the electrical equipment is much lower than the efficiency of the squirrel cage or synchronous installation. The slip ring induction motor permits of speed adjustment by means of secondary resistance, but only at the expense of the over-all efficiency of the electrical equipment. Thus, if the slip ring motor were operating at two-thirds of its normal speed, practically one-third of the power input to the motor would be wasted in secondary resistance, the remaining portion, with the exception of the normal motor losses, being delivered to the pump in the form of useful work. Since the horsepower required by a centrifugal pump drops off practically in proportion to the cube of the speed, the slip ring motor, in spite of the secondary resistance losses, shows a better economy than either the synchronous or the squirrel cage type operating at reduced capacity by throttling the discharge pump. A comparison of the power input to the motor, using squirrel cage and slip ring motors for the different pump capacities, is shown in Figure 5.

Although these curves indicate that the slip ring motor is the economical machine to install, particularly if the pump is required to operate over any great periods of time at reduced capacity, other factors would probably make the squirrel cage or synchronous motor the logical choice. Thus, if the pipe line passed through fairly level country so that the greater portion of the total pump head was utilized in friction loss in the line, it would be entirely possible to operate it at reduced capacity by shutting down every second station along the line and running the remaining stations at lower volume and correspondingly higher heads to take care of the friction losses between the stations in operation. With this scheme, the operating stations would not be running as efficiently as at full capacity, but this inefficiency is more than compensated for by the shutting down of half the stations. Another factor might enter into the picture in the form of a minimum charge clause in the power company's contract covering those stations not in operation.

A second solution would be to operate all the pumps at normal capacity until all the oil to be pumped for that particular day has been sent to the line, and then shut down the station. A study of the curves for power input to the squirrel cage motor, as shown in Figure 5, will show that the energy consumption per barrel of oil pumped is less when the pump is operting at normal capacity than when it is running at reduced capacity. Hence, purely on a power consumption basis, it is more economical to shut down the pump for a portion of the 24 hours and operate at normal capacity sufficiently long to pump the pipe line load. Here again the power contract influences the selection on account of the demand charge which the contract usually incorporates. With the motor operating at full capacity, the power drawn from the line is higher than when running at a reduced capacity and, obviously, the demand charge will be correspondingly greater.

Best Solution

A third, and probably, the best solution for taking care of reduced capacities, would be to install a two-speed squirrel cage or synchronous motor or, better yet, two separate motors, one rated normal horsepower, say 400 h.p., 1,750 or 1,800 rpm., but capable of running idle at the higher speed. Then, when the line is to be run at reduced capacity, it is a simple calculation to determine the running times for the low and high speeds to deliver the desired daily output. The kilowatt hours per barrel at the lower pump speed is, roughly, only half that required at the high speed, and hence it is quite desirable to pump as much oil as possible at the lower speed to give greatest economy.

The nature of the power contract will have a considerable bearing on the choice of the proper motor. The demand charge is sometimes based on the installed motor horsepower, although usually for installations as large as pipe line stations, it is a metered demand and may be given on the basis of either kilowatt or KVA. If the demand is on the basis of KVA it is imperative to have as high a power factor as possible which, of course, would indicate that the synchronous machine should be chosen. Usually the demand affects the number of kilowatt hours in the first energy block which again reflects in a higher power bill unless high power factor apparatus is used

If the demand is on the basis of measured KW., high power factor is of no great importance unless there is a power factor clause in the contract. Usually, however, this penalty applies only to power factors below 90 per cent and because all high speed induction motors of ratings normally used in pipe line pumping inherently have power factors above 90 per cent, any such penalty clause will have little, if any, effect on the power bill.

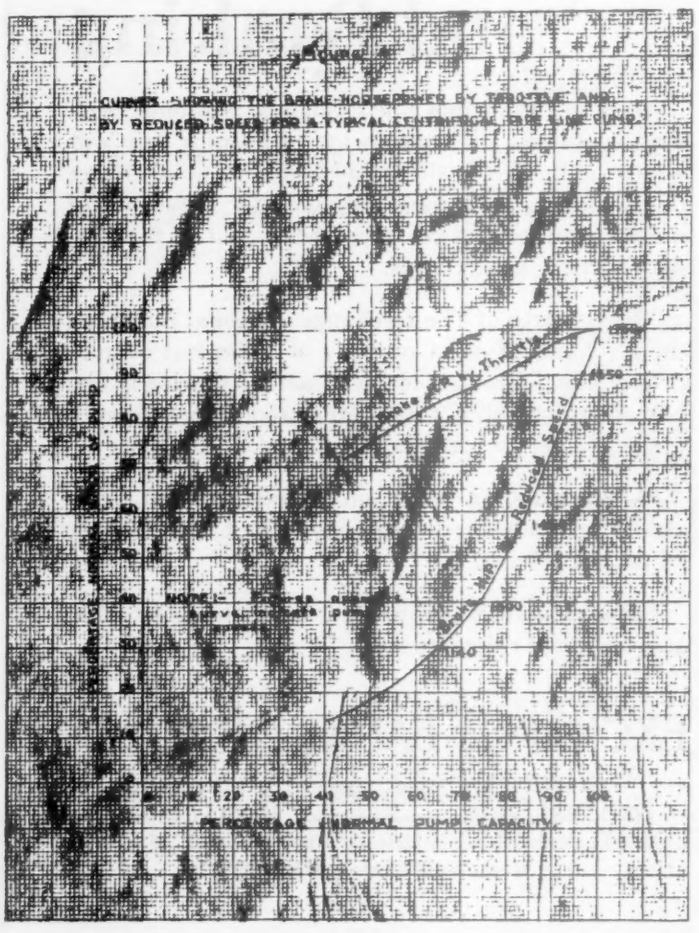

CURVES SHOWING THE BRAKE HORSEPOWER BY THROTTLE AND BY REDUCED SPEED FOR A TYPICAL CENTRIFUGAL PIPE LINE PUMP.
Curve for Throttle
Reduced Speed
1650
1140
PERCENTAGE NORMAL PUMP CAPACITY

Figure 4—Curve showing the brake horsepower required by centrifugal pumps for different capacities on the basis of throttling the discharge and also by running the pump at reduced speed.

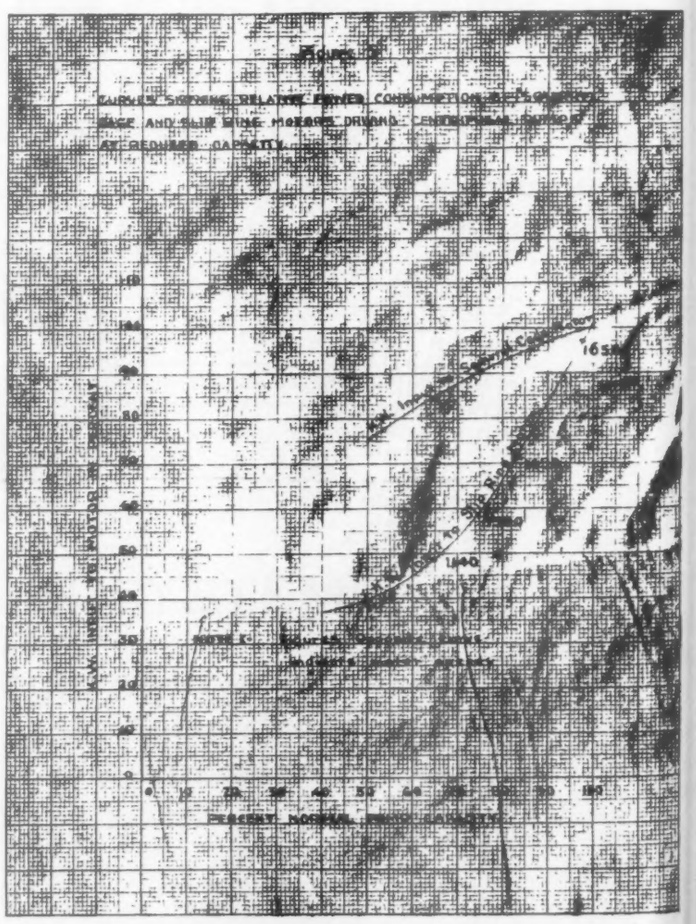
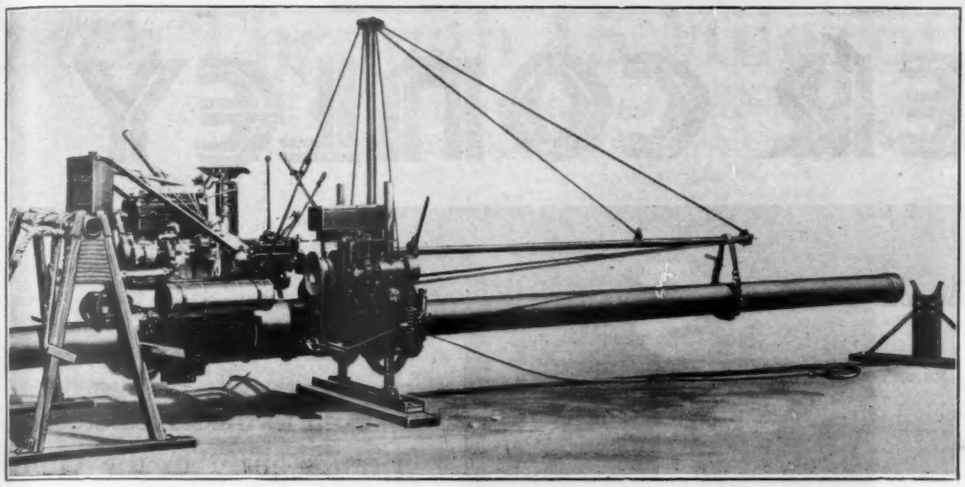

CURVES SHOWING RELATIVE POWER CONSUMPTION OF SQUIRREL CAGE AND SLIP RING MOTORS DRIVING CENTRIFUGAL PUMPS AT REDUCED CAPACITY.
1650
1140
PERCENT NORMAL PUMP CAPACITY

Figure 5—Curves showing a comparison of the power input to squirrel cage and slip ring motors when operating at various pump capacities.



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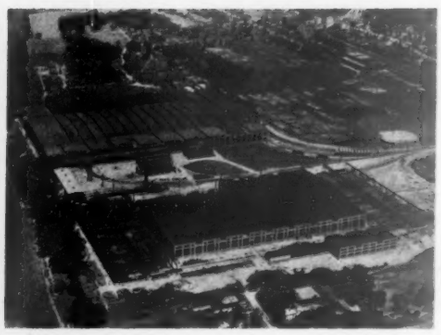

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Ditch Through 15 Miles of Solid Rock

Just One of Many Difficulties Overcome in Building Line for El Paso Natural Gas Co. From Lea County Field to El Paso

By H. G. Frost
Vice President and General Manager El Paso Natural Gas Co.

Fifteen miles of solid rock where every inch of the ditch had to be made by blasting offered only one of many difficulties overcome by Smith Brothers, contractors of Dallas, Tex., in laying the 218-mile pipe line for the El Paso Natural Gas Co. from the Lea County Field in southeast New Mexico, to El Paso, Tex. The line follows an almost straight course in a westerly direction from Jal, N. M., where it starts, to the town of Clint, Tex.

The first stretch of 50 miles from Jal to the Pecos River is extremely sandy and hauling could be done only with tractors.

The line crosses the Pecos River near Red Bluff, N. M., on a substantial steel wagon bridge. Here the line also crosses the Carlsbad-Pecos highway and the Santa Fe railroad.

The 50-mile stretch from Red Bluff west passes through "gyp" country and the Delaware mountains and is the roughest and most difficult part of the line. The 15 miles of solid rock occurs here.

Near the peak El Capitan, the highest point in Texas, the line crosses the Carlsbad-Van Horn highway. This highway and the railroad and highway at Red Bluff are the only roads crossed by the line from Jal to the valley of the Rio Grande. Along this entire stretch of 185 miles only four or five ranch houses are visible from the right of way, and only one house is passed within a distance of a mile of the line.

The average distance of hauling for stringing pipe was about 50 miles, and all of the supplies including water had to be transported long distances. Along parts of the line there was insufficient timber growth to furnish fuel for pipe bending.

Barren, Arid and Far From Supplies

The extreme barrenness of the country, lack of water and great distances from any place of supply, gave the contractors many difficult problems to solve.

The length of the line including the line through the city and to the industries on the other side, is approximately 218 miles.

The pipe throughout is 16-inch in diameter, manufactured by A. O. Smith Corp., longitudinally welded, one-fourth inch walls, 16-inch outside diameter, 30-foot lengths, 42.053 pounds per foot, and has a guaranteed tensile strength of 60,000 pounds. It is also guaranteed to have a working pressure of 450 pounds with a factor of safety of four. Upon completion of the line it was tested to a pressure of 500 pounds throughout its entire length.

Every seventh joint laid through level country was an A. O. Smith Corp. accordian-type expansion joint. At other places along the line where it is subject-

Electric welding—"The Firing Line."

ed to more severe conditions of expansion and contraction these accordian-type joints were introduced at more frequent intervals.

The pipe was given two coats of Texacoat cold paint where the soil is noncorrosive. Through corrosive soil, one coat of Texaco No. 30 pipe coating was applied hot and wrapped with Johns-Manville asbestos pipe line felt and tied with copper wire.

The line was electrically welded, using field generators made by the General Electric Co. and the Lincoln Welding Corp. Sixty-five electric welding machines were used and in addition some acetylene welding was done.

Much Hand Work Necessary

The ditching was done with Buckeye and Barber Greene machines. Hand ditching was necessary in the rock and numerous air compressors and pneumatic drills were operated by hand. Compressors and drills used were made by the Ingersoll Rand Co. and the Sullivan Machinery Co.

Pipe was handled and lowered by tractors equipped with W-K-M winches and booms. The pipe was lowered from three points of suspension, to avoid undue strains.

In welding, the joints were made by using Weldite Yellow Jacket five-thirty-second inch rod for a stringer bead and finished with Weldite No. 18 rod, three-sixteenth inch diameter, using four pounds of rod per joint. The amperage used was from 140 to 185 amperes at the generators.

It was found that the personnel of the welding crew was by far the most important factor in having the welding done properly. About nine joints for each welder per 10-hour day was about the best that could be done under favorable welding conditions. High winds and sand storms were frequent. During these it was necessary to protect the welders from the blown sand by shields which completely housed the operations. To check the work of the welders the inspectors cut frequent coupons from the welds with John T. Burr & Sons milling machines, especially designed for the purpose.

Anchored by Concrete Piers

At the Guadalupe Mountain crossing the line passes over a rimrock about 500 feet above the valley, which it attains at a 40-degree slope. The pipe is anchored here at frequent intervals by concrete piers, set into solid rock and with expansion joints used between piers.

The Pecos River is spanned by a 12-ton highway bridge and the line is manifolded in two 12-inch pipes, welded solid over the bridge section with long sleeve Dresser couplings at each end.

Westcott 16-inch gate valves with a working pressure of 650 pounds were placed at frequent intervals along the line and 6-inch blow-offs were installed on each side of the gate valves. Sixteen-inch ladder drips have been installed at depressions along the line to catch the condensations. One-inch siphons were installed every 5 miles. Orifice meter stations were placed at the gathering and distributing ends and midway along the line.

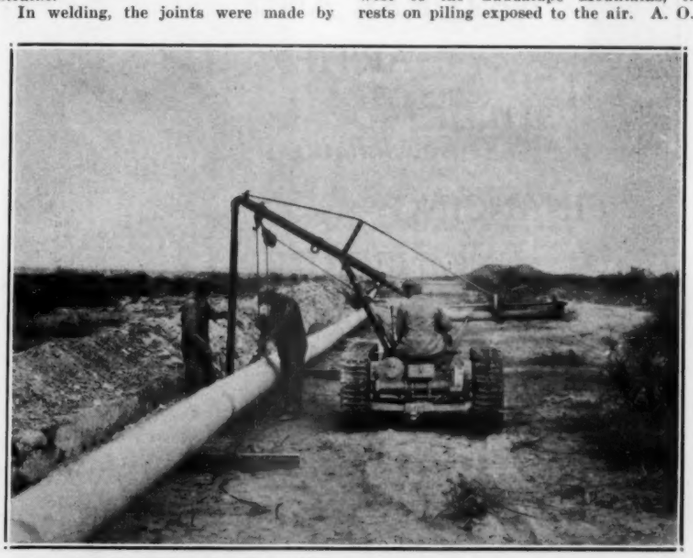
All under-crossings of canals, railroads and highways were cased with steel casing with vent holes at each end.

A telephone line of complete metallic circuit follows the line, with telephone booths placed at frequent intervals. The line is connected with the Bell Telephone system at El Paso. A road has been graded along the entire length of the line.

Line Rests on Piling

Where the line crosses the salt marshes, west of the Gaudalupe Mountains, it rests on piling exposed to the air. A. O.

Ditching machine at work in desert.



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Smith Corp. expansion joints were put at every fourth place along this part of the line, the remaining joints being welded.

On account of the high pressure at the wells, it will not be necessary to install compressor stations for several years unless the market in El Paso expands greatly beyond present expectations. It is evident that for a long period of time El Paso will have all the advantages that follow from a large supply of natural gas.

The El Paso Natural Gas Co. is under the direction of Paul Kayser, of Houston, Tex., president; H. G. Frost, El Paso, vice president and general manager; Sam H. Benbow, of Houston, secretary-treasurer; and A. L. Forbes, Jr., of El Paso, general superintendent. Its board of directors is composed of Paul Kayser, H. G. Frost, J. W. Colvin and A. C. Howard, all of Houston; and W. J. K. Vanston, C. M. Weld and R. S. Jarvis, all of New York.

White, Weld & Co. of New York, financed the company. C. Minot Weld, of Weld & Liddell, New York, reported on the project for the bankers; A. Faison Dixon, of Brokaw, Dixon, Garner & McKee, New York, reported on the gas supply.

Smith Brothers, Inc., constructed the line under a turn-key contract with F. G. Hoffman and P. B. Keller, in charge of construction. The inspectors and engineers were Brokaw, Dixon, Garner & McKee, New York.

The gas supply is derived from the Lea County Field. The principal gas sand, about 50 feet thick, is found at a depth of approximately 3,000 feet and the pressure at the wells is between 1,400 and 1,500 pounds per square inch. The gas is practically dry, testing less than 25 gallons of gasoline per million feet and most of the wells give gas entirely free of sulphur.

The open flow capacity of the wells is large. One well has a test open flow of 90,000,000 feet per day. The wells now under contract to the company have an open flow capacity of 350,000,000 feet per day.

The extent of the field, as indicated by present drilling, is 30 miles north and south and 4 miles east and west. The gas supply shows an amount of gas sufficient to supply any market in El Paso that is likely to be developed for at least 35 years.

The El Paso Natural Gas Co. is selling gas at the city gate to the Texas Cities Gas Co. which distributes the gas to the consumers inside the metropolitan district of El Paso, with its population of 118,000.

The El Paso Natural Gas Co. is selling direct to the chief large consumers, such as the electric power company, the cement and brick plants and the smelters. It will also sell directly to the consumers along the Rio Grande Valley from the town of Fabens to El Paso, a district which has a population of 4,000.

Terminal metering station at El Paso.

RUSSIA GIVING SERIOUS THOUGHT TO CONSTRUCTION OF PIPE LINES

Great efforts have been made by the Soviet authorities during the past few years to reorganize their petroleum industry and to introduce modern methods. The steps taken have covered the pipe line systems as well as the fields and refineries. The work already carried out, together with the boldness of the schemes under consideration, clearly indicate the modern outlook of the engineers responsible.

Up to the end of 1928 most of the oil products to be exported had to be carried to the Black Sea port of Batum by tank car over a railway some 600 miles long and with a very difficult profile. This was supplemented by the old Transcaucasian 8-inch pipe line running beside the railway and used chiefly for lamp oil. In 1927, the construction of two new lines was begun, one from Baku to Batum and the other from Grozny to the newly built port of Tuapse. This latter line was completed about the end of 1928. It is a 10-inch welded line 384 miles in length. The present capacity is about 1,000,000 tons per annum, there being six pumping stations. An additional five pumping stations are projected and it is calculated that when these are in operation the capacity of the line will be about 1,500,000 metric tons per annum. The pumping stations are Diesel equipped, and eventually each station is to have three engines of 300 horsepower each, to-

gether with three pumps. It was estimated in the original calculations that the saving in transport costs via this line as compared with the railway would in four years cover the capital cost of the line. This pipe line was, of course, intended for crude oil and simultaneously with its commencement, the construction of a modern refinery capable of handling 1,200,000 metric tons per annum was put in hand.

The other new pipe line, namely, that from Bacu to Batum has a length of 522 miles and is also 10-inch in diameter. This line passes over very difficult country and rises at one point—the Marazy Pass—to 2,690 feet above sea level. The design called for 14 pumping stations and it is expected that when these are all in operation the capacity of the line will be about 1,400,000 tons per annum. The 52,000 tons of pipe for this line was bought from Germany. The pipe thickness is 9.3 mm. (about three-eighth inch), the weight 41.5 pounds per foot and the test pressure 1,300 pounds per square inch. The power for the pumping stations is similar to that on the Grozny Tuapse line, namely, three 300-horsepower Diesel engines in each station with the exception that the first two stations are electrically driven as they could economically be tied into the Bacu electricity supply system. This pipe line is now practically completed and half of it is already in use.

In addition to the above the following new pipe lines have been seriously considered:

Kala (on Caspian sea) to Moscow, 930 miles.

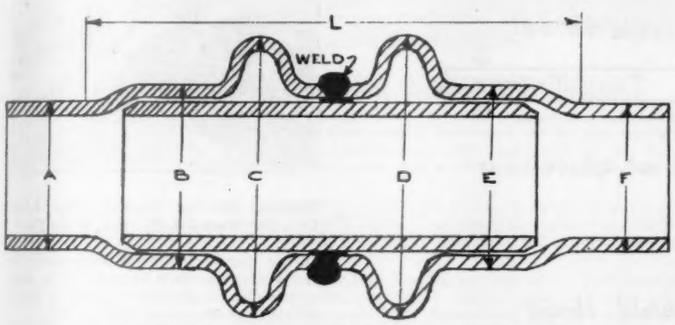
Kala to Rostoff, 500 miles.

Emba to Samara, 380 miles.

It is probable that the recent discovery of oil on the western slopes of the Ural Mountains near the town of Perm will cause the whole pipe line question to be reconsidered.

NEW WRINKLE JOINT TAKES CARE OF EXPANSION AND CONTRACTION

A new type of welded joint has been used by the Gulf Pipe Line Co. in the construction of an extension from its West Texas trunk line system from Midland Junction to the Hendricks Field, West Texas district. Construction work on this extension line, which included about 60 miles of 10-inch pipe used in this line, and a portion of the smaller line is equipped with the National Tube Co.'s new oil and gas line pipe, equipped with an integral expansion joint and an internal sleeve, which serves to reduce line breaks during extreme temperatures, and affords a rapid and secure weld.



DIMENSIONS OF JOINT BEFORE AND AFTER TEST

	A	B	C	Weld	D	E	F
Before	10.75	11.53	13.65	11.71	13.70	11.53	10.76
After	10.68	11.37	11.95	11.61	11.98	11.44	10.75

This new pipe joint has been dubbed by pipe liners as the "Wrinkle Joint" owing to the presence of a wrinkle circling each joint near the end, thereby taking care of the bulk of the expansion and contraction through this wrinkle flattening out, or closing up. The pipe ends are larger than the normal size of the joint in order to permit the insertion of a diameter as the main body of the pipe, with a length about equal to its diameter. This sleeve intersects the two joint ends, forming a bridge, and welders connect the joints, with the sleeve serving as the base for the weld. The interior of the line is of a uniform diameter, and difficulty with "icicles" or protuding welds, is entirely eliminated.

The accompanying sketch shows a cross section of the new type joint, which sleeve, or nipple, which is of the same is now being marketed by the National Tube Co. in all standard sizes for oil or gas transportation, with chart showing variations in the dimensions during the expansion and contraction of each section of the joint when given mill tests for tensile strength. Test data shown applies to 10-inch, 34¼-pound seamless line pipe. On an internal water pressure test that portion of the joint indicated by "L" registered an elongation of .03125 inch when subjected to 500 pounds pressure per square inch, and .125 inch at 900 pounds. The pressure was relieved slowly at this point to 750 pounds, and the joint returned about .01 of an inch, with elongation of .115 inch remaining. The joint returned about .02 inch more when the pressure was lowered to 500 pounds, and .03 inch additional with pressure released to 300 pounds per square inch. At 1,000 pounds pressure, which was determined on a retest, the joint registered an elongation of .171875 inch, and slow release of pressure resulted in the joint returning three-sixty-fourth inch, with a set of one-eighth inch.

This type of pipe line joint is first made and tested similar to that of regular pipe by the mill. It is then heated and upsetted to permit the insertion of the die that forms the wrinkle at the ends. Original wall thickness is retained by the pipe at the wrinkle through this shaping process, thereby giving slightly more poundage of steel on overall length as compared to a regular pipe.

The "wrinkle joint" is credited with giving about twice the amount of expansion and contraction that is available in regular butt weld, or plain end pipe. The amount of slack used in the laying of Gulf Pipe Line Co.'s 10-inch section was reduced about one-third of that normally thrown into a line of similar size and conditions. Stabbing of pipe ends is facilitated by the use of the sleeve or nipple, while no welding clamps are necessary.

Gulf Pipe Line Co. also made use of the new type of joint on the 8-inch pipe section of the Midland-Hendricks extension line, having inserted welded joints at 1,000-foot intervals to cut down the slack allowance normally allowed on a screw joint line.

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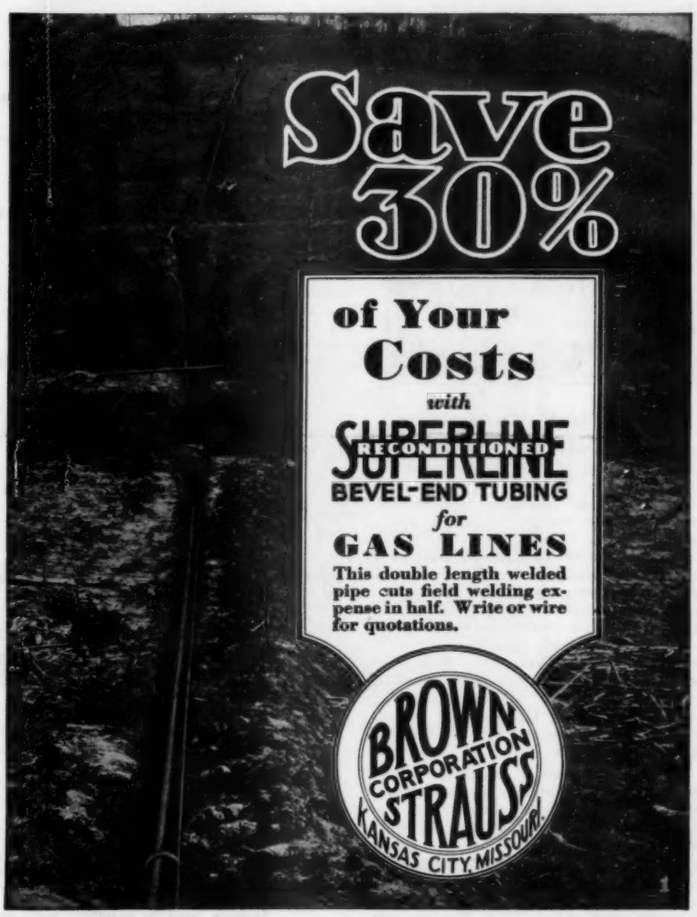

Electric Welding of Pipe Line Joints

Material Obtained From Study of Methods Used on Approximately 1,250 Miles of Gas and Oil Lines

By R. W. Van Kirk
General Electric Co., Dallas, Tex.

The following data and recommendations are offered to facilitate the electric welding of pipe line field joints. The material was obtained from a study of the methods used by successful welding contractors in the electric welding of approximately 1,250 miles of gas and oil pipe lines.

The metallic electrode for welding the commercial grades of iron and steel pipe should be a high grade of low carbon steel wire which has a carbon content of 0.20 per cent or less. With the proper electrode and procedure electric welded field joints are being made which are stronger than the pipe itself. The wire should be cut into convenient lengths of 14 to 18 inches.

Commercial thickness of pipe, 6 to 20 inches in diameter, will require two beads, using generally five-thirty-seconds-inch diameter electrode on the first bead and three-sixteenths-inch to one-quarter-inch on the second. The skill of the operator will be a factor in determining the correct size of electrode.

Welding Currents

For the first bead with five-thirty-seconds-inch electrode the welding current will range from 140 to 170 amperes and for the second bead with three-sixteenths-inch to one-quarter-inch from 160 to 200 amperes. In general the greater diameters and thicknesses of pipe will require the higher currents. The skill of the operator will also govern somewhat the current used, the higher currents requiring greater skill.

Expansion joint welded in place.

Single operator welding machines are available, consisting of a variable voltage type welding generator direct connected to a gasoline engine. They should be selected with sufficient capacity to provide the current requirements with continuous welding and with further regard to arc stability, making for ease of welding, lightness of weight, facilitating transportation along the line, and ruggedness of construction to withstand rough handling in service.

Figures 1, 2 and 3 illustrate typical field joints. It is common practice to reinforce the weld approximately 20 per cent, that is, the thickness of the weld throat should be about 20 per cent greater than the thickness (T) of the pipe.

Welding Procedure

The welding crew is preceded by the lining-up crew which lines the pipe up in long straight sections, on wooden skids using metal shoes with rollers. The use of the shoes is optional but it is our opinion that such use will result in increased speed and quality of weld which will amply repay the contractor or pipe line company for their cost. The length of the long sections will be determined by the topography of the ground being traversed, the diameter of the pipe, and the machinery available for handling them after they have been welded. In general they will be from 200 to 300 feet in length.

SIZE OF THE WELD:

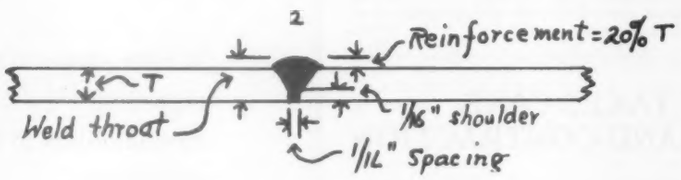

Fig. 1 - Butt Weld

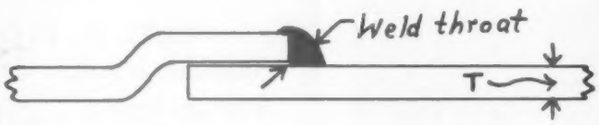

Fig. 2 - Lap Weld on Bell and Spigot Joint

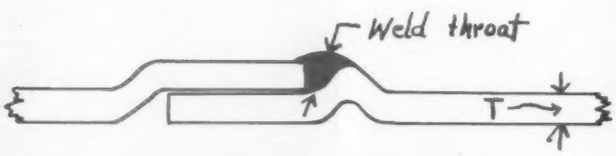

Fig. 3 - Lap Weld with Welding Dam on Spigot End.

A convenient number of welding machines for a crew is 12, consisting of four making the first bead, six on the second bead, and two on the tie-in welds. They should be distributed two machines to a long section both mounted as a unit on one wagon or other suitable means of transportation. Each machine should be provided with a 175-foot extension and a 50-foot return cable. They should be located at the middle of the long section and not moved until their assignment for that section has been completed. In moving them one caterpillar tractor is found sufficient to handle a crew of 12.

Welding pipe on Pasotex Pipe Line Co.'s line from Jal, N. Mex., to El Paso.

In laying the first bead the operator should begin at the center of the side of the pipe and weld to the top center, taking care to penetrate thoroughly. He should then move over to the other side of the pipe and weld from the center up, meeting the initial bead at the top, then proceeding to the next joint. While he is welding on this joint the helper should clean the scale thoroughly from the previous bead, using a hammer, chisel and wire brush, chipping the beginning and end of the bead clean.

When both operators have completed

Tractor used in handling sections of pipe on Pasotex Pipe Line Co.'s line from Jal, N. Mex., to El Paso, Tex.

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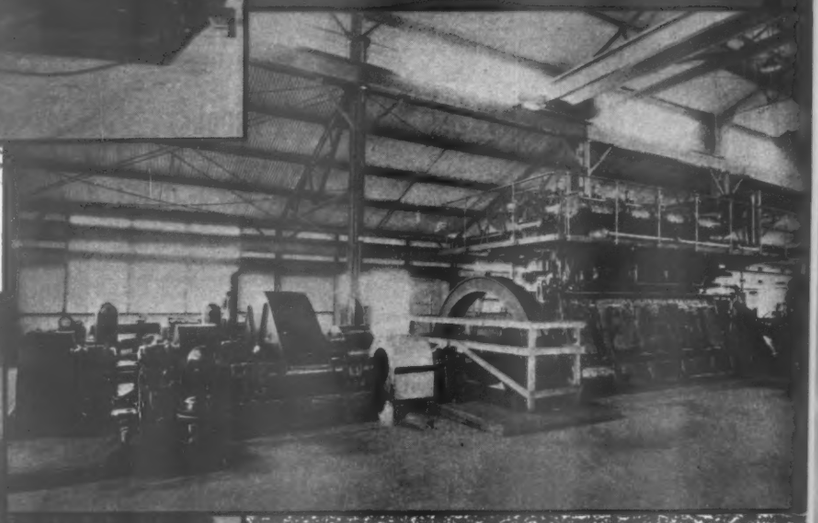
HUMBLE Pipe Line Company

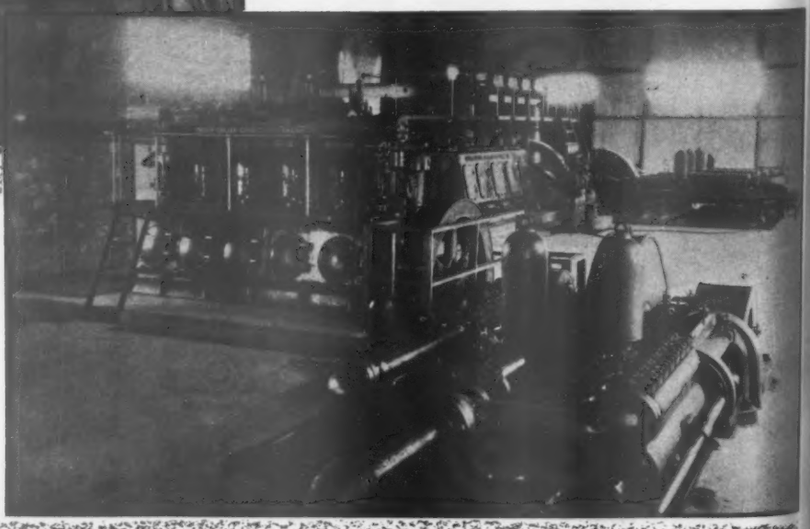
Above is shown a 6" x 24" Prescott triplex pump, 25,000 bbl. capacity, installed in the Pendell, Tex., station of the Humble Pipe Line Company.



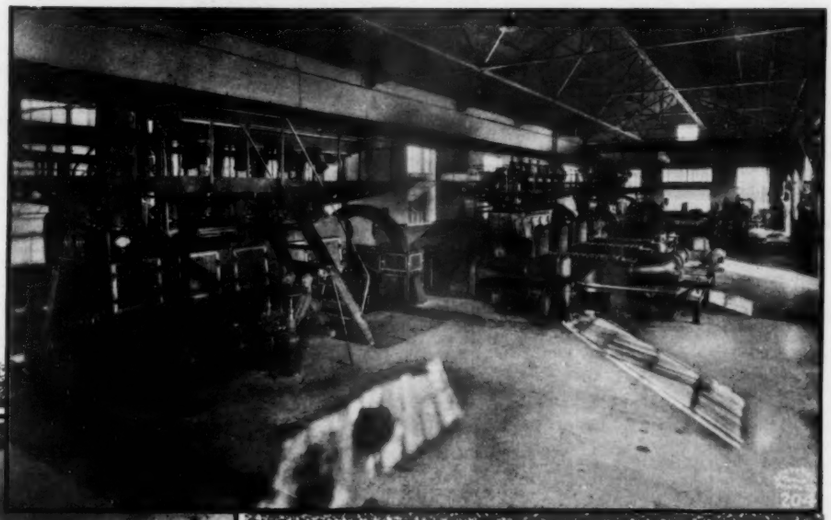
The 6" x 24" Prescott triplex pump, 25,000 bbl. capacity, as shown above is installed in the Kemper, Tex., station of the Humble Pipe Line Company.

The picture above shows a 5¼" x 18" Prescott duplex pump, 10,000 bbl. capacity, installed in the Humble Pipe Line Company's station at Comyn, Tex.

The picture at the right shows a 5¼" x 18" Prescott duplex pump, 10,000 bbl. capacity, and a 6" x 25" Prescott triplex, 25,000 bbl. capacity, in the Chilton, Tex., station of the Humble Pipe Line Company.



At the right is shown the 6" x 24" Prescott triplex pump, 25,000 bbl. capacity, as installed at the Satsuma, Tex., station of the Humble Pipe Line Company.



This picture below shows a 6" x 24" Prescott triplex pump, 25,000 bbl. capacity, at the Hearne, Tex., station of the Humble Pipe Line Company.

A view of the Satsuma, Tex., station of the Humble Pipe Line Company. This is another one of the many Humble stations containing pumps manufactured by the Prescott Company, Menominee, Mich.

Uses

PRESCOTT MENOMINEE

PUMPS

O&GJ 8-29 Gray

all the joints in their section one-half the way round, the pipe should be turned over and all first beads completed. After all beads have been cleaned the operators and equipment are ready to be moved to the next section.

The second bead should be started at one side, welding toward the top. The first bead makes the joints amply strong so that the pipe may be turned while welding, permitting the laying of a continuous second bead. In completing the weld the ending should be continued over the beginning of the bead and then curved slightly so that it will end on the bare metal of the pipe rather than on top of the previous bead. Peening the end of the weld is not considered necessary and is not recommended.

After completion of the second beads the long sections are ready to be lined up on skids over the ditch. The tie-in welding machines are arranged in single units as the tie-in welds are several hundred feet apart. In welding these joints the pipe cannot be turned. As a result, part of the weld must be made overhead requiring an experienced operator. When the tie-in welds have been finished the pipe is a continuous tube ready to be lowered into the ditch.

Qualifying Operators

The tests for determining the ability of operators must be made with materials and testing tools which are readily available in the field. The welding should be done under field conditions and should conform to the specifications of the job. A section of standard butt weld pipe can be cut up in short sections about 6 or 8 inches long and machined to the standard bevel in a local machine shop. One 20 or 30-foot section will provide a large number of test joints. The test consists of requiring the operator to weld two or more of these test sections together. This same test will serve for bell and spigot joints although if desired alternate 6 or 8-inch lengths can be cut through at one side and spread open to form the bell.

The welding inspector and supervisor are jointly responsible for the work and should combine in conducting the qualification tests. They should adjust the current to the average value with which the operator will be expected to work. The test welding should be watched closely for (a) The holding of a short arc; (b) Thorough penetration, and (c) Regular steady movement of the electrode.

When the test weld is completed several specimens 1 to 2 inches wide should be cut from it. These may be placed on a "V" block or in a vise and held so that, using a sledge, the coupon may be bent double with the bend coming directly at the weld. It will usually not be possible to break a weld, made by an experienced operator; however, if a fracture in the weld is obtained it should be inspected closely for penetration and for proper appearance of the deposited metal.

If the test weld fractures it should resist stubbornly tearing away irregularly. The weld metal should be dull gray with a close even textured and fibrous appearing structure. There should be no blowholes, slag inclusions, and brown or blue colored metal.

Inspection

The first duty of an inspector is to insure the proper preparation of the joints. Commercial pipe is usually covered with a rust-resisting coating which should be thoroughly removed. The next step is to insist that the pipe sections be lined up as straight as possible. A poor line-up will result in a joint touching on one side and a wide gap on the other. In the ditch such a joint will be subject to localized stresses seriously affecting its over-all strength.

The other duties of the inspector are to check: size of the beads, fusion, and quality of the deposited metal. Inspecting the size of the beads is a mechanical operation requiring no particular skill. A simple gauge can be made by cutting a corner from a small sheet of thin metal, to fit over the appropriate size bead.

Quality of the Deposited Metal

The weld metal should be smoothly laid and should have a clean steel blue color. A smooth neat appearing bead is not a requirement of a successful weld, nevertheless it is an indication of the operator's steadiness in manipulating the electrode. If the metal looks burned in places a test coupon should be cut out, carefully examined and tested by bending or be given a tensile strength test.

The weld should be examined closely for minute pinholes indicating porosity and sponginess. This may be caused either by low current or too rapid welding speed.

If the weld rusts while cooling it is an indication that too long an arc was held. This will result in the absorption of oxygen and nitrogen, both of which are detrimental to the quality of the weld. With a short arc, the flame consisting of vapors coming out of the arc, acts as a protection and largely prevents the absorption of these outside gases. One or more test coupons should be cut out of such a joint.

Fusion

The first requirement for fusion is that the bead must make a smooth fillet where it joins the pipe. It must not overlap, that is, seem to roll over on the pipe rather than be a continuation of the pipe metal. A common test is to place a knife blade at the edge of the bead. If it can be inserted at all under the edge of the weld metal improper fusion has resulted.

At the point where the arc strikes the pipe the pipe metal is melted and is forced out of the molten pool by an action of the arc. This depression is called the crater and will be found at the point where the weld was finished. The crater can also be noted while welding and when the operator is changing electrodes. Its depth and general shape provide another means of judging the penetration and fusion and of predicting the soundness of the weld. Its depth in general should be at least 1-16 inch.

The crater should be neat and circular in shape. If it is small relative to the size of the bead the welding current should be increased while a large elongated crater would indicate too much current. A little experience will soon show the distinction between these two types of craters.

If a reliable uniform welding electrode is being used with the proper current and a spattering of large globules of metal is found near the weld, it indicates too long an arc. Such joints should be examined carefully and the offending operator watched closely.

The sound of the arc is also a good criterion of the quality of the work. An experienced inspector can pass on a weld with surprising accuracy by listening to the sound produced by the arc. A good weld on clean material with the proper current and a short steady arc is indicated by a rapid, sharp, sputtering and crackling sound. A long arc will be accompanied by a hissing sound. An unsteady arc will result in intermittent crackling, hissing and breaking of the arc. This same result will also be obtained by an improperly cleaned joint.

The voltmeter and ammeter, furnished as standard equipment on welding machines, also provide an excellent means for indicating the steadiness and length of the arc. With the currents and electrode sizes in use on pipe line work the arc voltage should hover closely at about 20 volts. The ammeter will generally fluctuate through a comparatively wider range. It produces a very necessary service, however, in indicating the current, or heat of the arc. The value of current used is found to very materially affect the quality of the welds and one of the inspector's most important duties is the determination of the proper current.

Cutting Out Inspection Coupons

For the mutual protection of both the pipe line company and the welding contractor test coupons should occasionally be cut at random from welds made by each operator as well as from all doubtful welds. The knowledge that any of his welds may be given such a detailed inspection will serve as a check in making the operator careful.

These coupons may be obtained with a cutting torch or a milling machine. In cutting them out care should be exercised that they are not damaged in any way so that they will be a reliable indication of the quality of the weld. They can be tagged and shipped in for full laboratory examination.

Number Welds Per Day and Cost Data

Using the general procedure as outlined, contractors are obtaining the following results in electric welding pipe lines:

Based on continuous operation butt or bell and spigot joints:

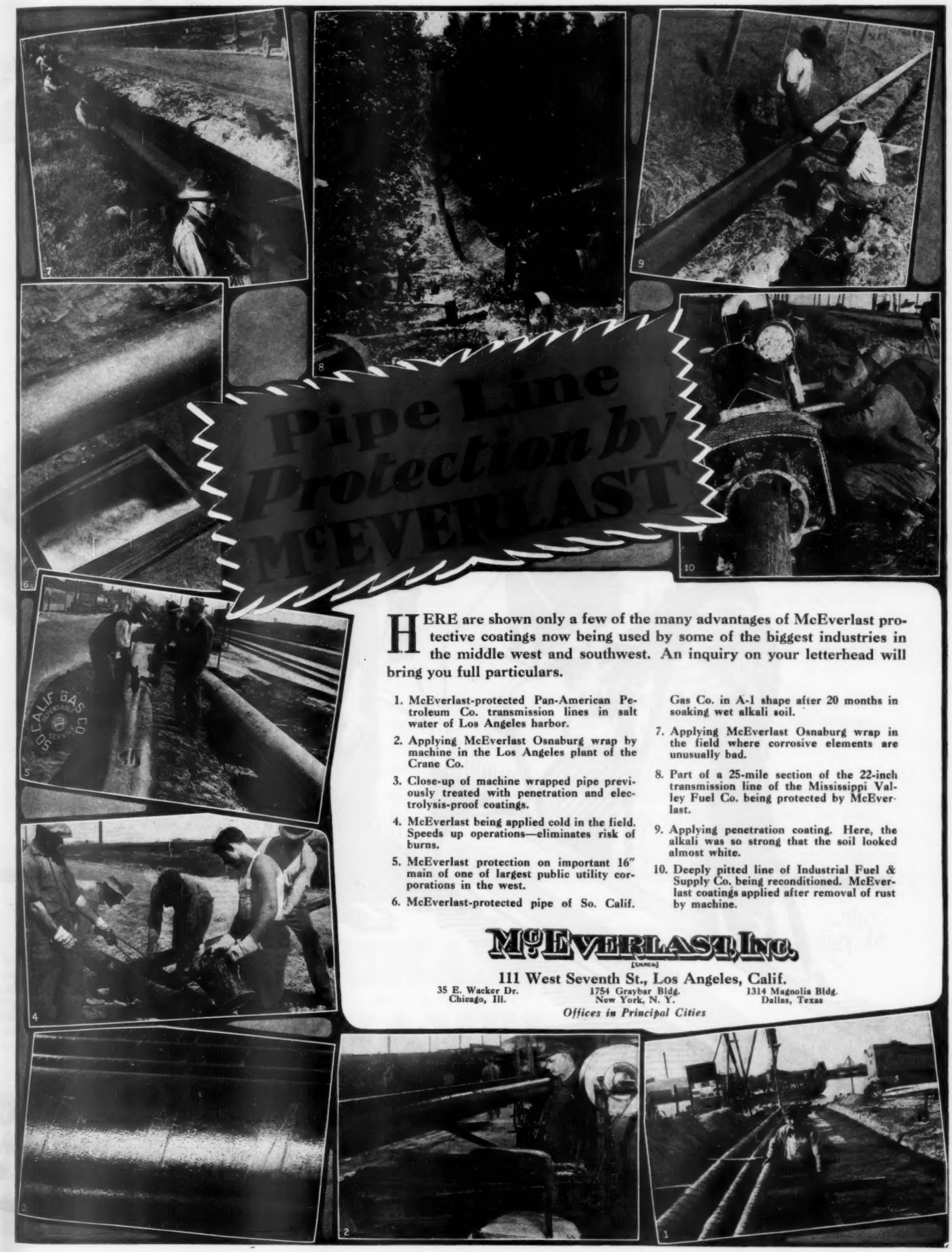
Pipe Diameter—	6-in.	8-in.	10-in.	12-in.	14-in.	16-in.	20-in.
Number of joints per machine in 10 hrs....	30	24	19	15	11	8	6
Pipe igths.							
Number of welding ..... 20 ft.	9	12	15	18	24	33	45
Machines required ..... 30 ft.	6	8	10	12	16	22	30
For 1 mile per day ..... 40 ft.	5	6	8	9	12	17	23
Pounds rod per weld	1.4	1.8	2.2	2.8	3.6	4.6	6
Cost rod per weld	$0.119	0.152	0.187	0.238	0.306	0.391	0.510
Gallons gasoline per weld	0.4	0.6	0.8	1.0	1.4	2.1	3.0
Cost gasoline and oil per weld	$0.777	0.110	0.146	0.183	0.255	0.372	0.533
Total cost gasoline, oil and rod per weld....	$0.196	0.263	0.333	0.421	0.561	0.763	1.043

Basis of Data

The above data is based on the use of the butt or bell and spigot joints which call for welds as illustrated in Figures 1 and 2. With the bell and spigot joint, manufactured with a welding dam on the spigot end, the number of welds per day will be increased approximately 25 per cent.

PIPE LINE ENGINE AND PUMP HOUSE

Section of 205-mile welded oil line extending from Jal, N. Mex., to El Paso, Tex.



HERE are shown only a few of the many advantages of McEverlast protective coatings now being used by some of the biggest industries in the middle west and southwest. An inquiry on your letterhead will bring you full particulars.

1. McEverlast-protected Pan-American Petroleum Co. transmission lines in salt water of Los Angeles harbor.
2. Applying McEverlast Osnaburg wrap by machine in the Los Angeles plant of the Crane Co.
3. Close-up of machine wrapped pipe previously treated with penetration and electrolysis-proof coatings.
4. McEverlast being applied cold in the field. Speeds up operations—eliminates risk of burns.
5. McEverlast protection on important 16" main of one of largest public utility corporations in the west.
6. McEverlast-protected pipe of So. Calif. Gas Co. in A-1 shape after 20 months in soaking wet alkali soil.
7. Applying McEverlast Osnaburg wrap in the field where corrosive elements are unusually bad.
8. Part of a 25-mile section of the 22-inch transmission line of the Mississippi Valley Fuel Co. being protected by McEverlast.
9. Applying penetration coating. Here, the alkali was so strong that the soil looked almost white.
10. Deeply pitted line of Industrial Fuel & Supply Co. being reconditioned. McEverlast coatings applied after removal of rust by machine.

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Year

Modern methods of applying hot enamel
so fast and so thorough that no pipe
laid today should be buried without the
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up to 16" diameter. For larger sizes
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Philadelphia **Cleveland**

T after Year after Year

For long, long years ***Bitumastic Enamel*** coatings upon steel structures have been buried in the ground, submerged beneath the sea, sunk in the slime and ooze of swamps and river bottoms. Year after year the corrosive elements of alkaline soils, the acid-filled waters of tropical rivers, the alternating action of salt air and salt water, bilgewater and brine have gnawed at ***Bitumastic Enameled*** surfaces without affecting them. Forty years of experience have been insufficient to determine the effective lifetime of ***Bitumastic Enamel.***

Year after year the proof of this positive protection has accumulated. Year after year it continues to resist all corrosive elements. Year after year it demonstrates its reliability as a perfect coating for steel.

Protect your pipe lines with ***Bitumastic Enamel*** and avoid corrosion year after year after year.

All over the world, Oil and Gas lines are being insured against corrosion by ***Bitumastic Enamel.*** Only because of its proven protection is ***Bitumastic Enamel*** chosen in preference to all others.

A copy of our new booklet "The Protection of Oil and Gas Lines" will soon be ready for delivery. Ask us to put you down for one.

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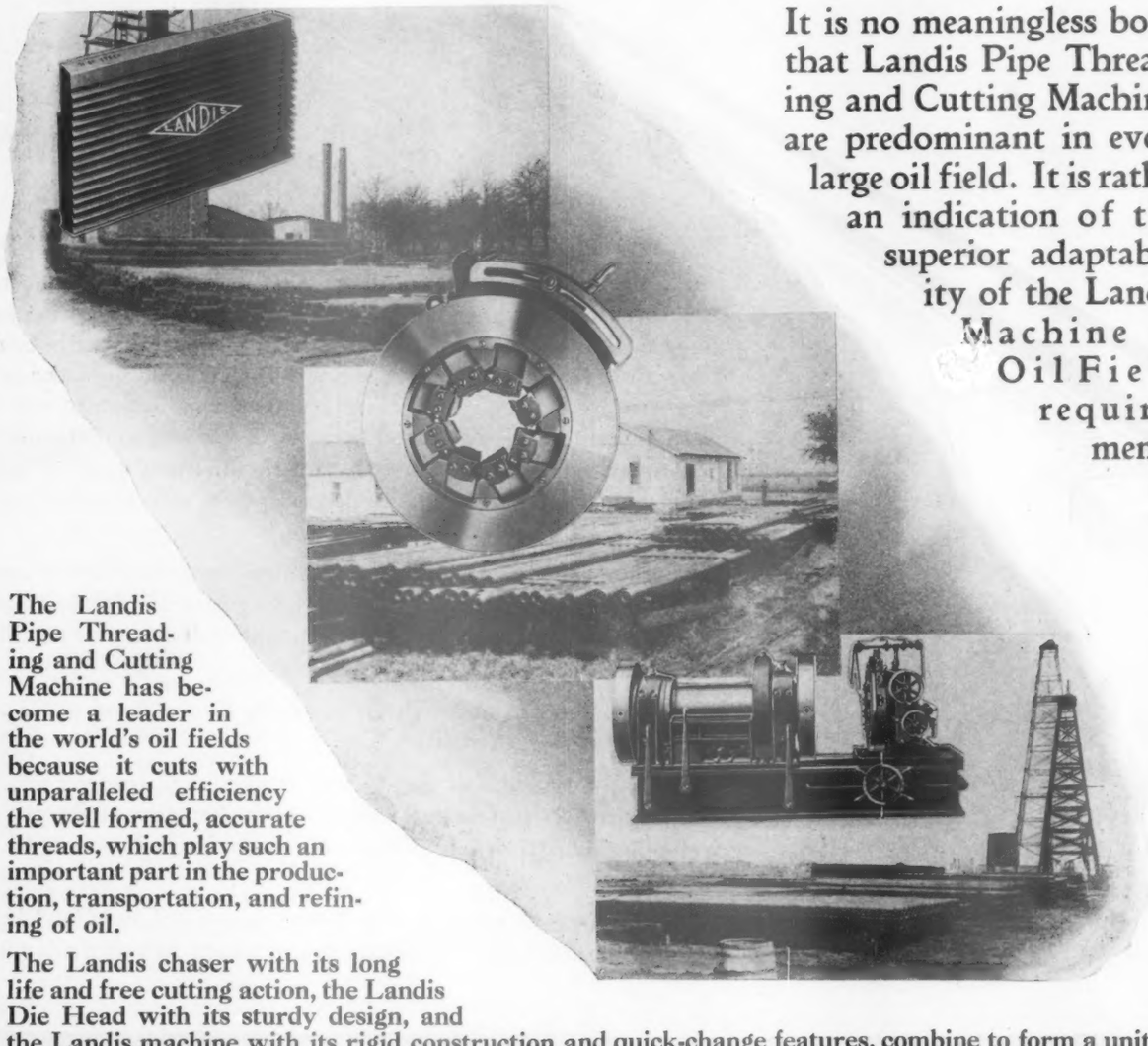
WHY THIS PREDOMINANCE?



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The Landis Pipe Threading and Cutting Machine has become a leader in the world's oil fields because it cuts with unparalleled efficiency the well formed, accurate threads, which play such an important part in the production, transportation, and refining of oil.

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Pipe Line Construction During 1928

Pipe line construction during 1928, as reported to the Government by the various pipe line companies, follows:

Name of company—		Miles operated at close of year	Investment: Gathering lines	Trunk lines	Other lines	Total	Oil transported: Bbls.	Revenue
Arkana Transit Corp.:	Trunk	32.21	.....	$250,153	$14,662	$264,815	409,958	$50,620

Changes in mileage during year—None.
Owned by, etc.—Atlantic Oil Production Co., 60 per cent; Louisiana Oil Refining Co., 40 per cent.

Buckeye Pipe Line Co.:	Trunk	1,441						
	Gathering	5,817	10,863,903	9,258,349	3,578,897	23,701,149	*35,331,429	4,230,757
		7,258						

Laid: Gathering lines: Sizes of pipe not shown. 12 miles, Lodi to Beren, Ohio; 33 miles, to connect Cambridge Pool; 20 miles, changing Pyne Gravity line.
Laid: Trunk lines: 19 miles, Bayshore line, between Cygnet Station and Bay Shore.
Purchased: Gathering lines: 7 miles from R. G. Stitt Pipe Line Co. in Lucas and Wood Counties; 586 miles from Pure Oil Pipe Line Co., southeast Ohio.
Established during year following fund accounts to cover reserve for annuities and reserve for fire insurance. Annuity fund, $1,272,164.13; Fire insurance fund, $498,393.13; total $1,770,557.26.
*Increase of 4 per cent over 1927. No business handled for Atlantic Seaboard.

Cumberland Pipe Line Co.:	Trunk	316.669						
	Gathering	913.7714	2,863,537	1,768,193	1,110,681	5,742,411	2,790,592	669,929
		1,230.4404						

Buildings $8,539. Tanks $1,521.
Capital stock reduced 50 per cent during the year from $3,000,000 to $1,500,000.

Empire Pipe Line Co.:	Trunk	501.02						
	Gathering	309.16	1,461,683	7,054,700	.....	8,516,383	21,706,469	2,353,456
		810.18						

Telegraph line, Drumright to Healdton; string telegraph lines, Bartlesville to Ponca City; extend pipe line, Burbank Field; install pump station and lay lines in Greenwood County, Texas; lay line to Oklahoma City loading rack; reclaim loading rack at Nims; reclaim lines and pumps, Kingwood Field; reclaim gathering lines near Depew; reclaim lines and tanks at Burbank Station; reclaim engines at tester station; reclaim gathering lines, Carter County, Oklahoma; reclaim telegraph line, Cimarron to Guthrie; reclaim gathering lines, Okfuskee County, Oklahoma; reclaim gathering lines, Butler County, Oklahoma; reclaim gathering lines, Beaumont Field. (Sizes not named.)

Eureka Pipe Line Co.:	Trunk	229.26						
	Gathering	4,621.419	10,103,718	1,320,496	2,222,614	13,646,828	9,409,664	2,198,716
		4,850.679						

Extension of pipe lines $394,085.91. Oil tanks, new and additions and betterments $54,533.90. Buildings and machinery $11,350.54.

Gulf Pipe Line Co.:	Trunk	2,798.88	6,332,553.23	41,053,052.23	3,247,025.40	49,732,630.86	46,973,449	15,827,496
	Gathering	857.897						

Changes in mileage during year: Gathering lines: All locations: 2-inch 10.14 miles; 3-inch .41 mile; 4-inch 16 miles; 6-inch, 23.98 miles; 8-inch 23.83 miles; total 53.26 miles. Trunk lines: System No. 1: 6-inch .01 mile; 8-inch 171.24 miles; total 171.25 miles. System No. 2: 6-inch 13.42 miles; 8-inch .24 mile; 10-inch 2.15 miles; total 11.03 miles.
Building 125 miles of telegraph and telephone lines, cost $20,380. Building six cottages $32,000. Building and enlarging stations and new tanks $1,225,000.
Note—Owned by Gulf Corporation Co. of Pennsylvania through ownership of 34,993 out of 35,000 shares of stock.

Gulf Pipe Line Co. of Oklahoma:	Trunk	690.29						
	Gathering	828.93	4,554,918.82	7,191,196.04	.....	11,746,114.86	32,750,760	5,606,202

Gathering line investment increased during the year on account of adding and laying new fuel lines and building new gathering stations.
Trunk line investment increased during the year on account of adding new equipment at stations.
Note—Number of barrels gathered in number of barrels transported by trunk lines except 255,408.53. Number of barrels loaded is also included in number of barrels gathered in Kansas.

Humble Pipe Line Co.:	Trunk	3,182.23						
	Gathering	2,541.66	16,734,123.84	58,229,820.72	.....	74,963,945	143,147,619	34,671,652

New line laid: 8-inch, Big Spring to Kemper; 8, 10 and 12-inch line, Ingleside to Harbor Island; 8-inch line between Raccoon Bend and Satsuma, and 8-inch line between Sugarland and Pierce Junction.
Lines installed: 1.20 miles 8-inch, Chilton to Hearne; 26.61 miles 8-inch between Yates, Pecos and Kemper; 60.72 miles 8-inch, Big Spring to Kemper; 31.30 miles 8-inch, Raccoon Bend and Satsuma; 15.12 miles, 8-inch, Ingleside and Harbor Island; 14.43 miles, 8-inch, Sugarland to Pierce Junction; 1.97 miles, 10-inch, Webster to Baytown; 4.29 miles, 10-inch, Skidmore and Ingleside; 4.39 miles, 10-inch between Whitsell and Skidmore; 4.87 miles, 10-inch, Lytle to Whitsell; 22.30 miles, 12-inch, Ingleside to Harbor Island; 25.28 miles, 12-inch, Whitsell to Skidmore; 28.65 miles, 12-inch Lytle to Whitsell; 3.40 miles, 12-inch, Ingleside and Ward Island; total, 262.0 miles.
Lines taken up: 32.36 miles 8-inch, Groesbeck to Hearne; .23 mile 8-inch, Beaumont to Hull; 3.40 miles, 8-inch, Bruni to Ingleside; .01 mile, 10-inch, Putnam to Comyn; .80 mile, Chilton to Hearne.
Note—Capital stock issued during year to provide funds to carry out expansion program and build extensive pipe lines and facilities as follows: Common $6,000,000; consideration realized $6,000,000; total outstanding $50,000,000.

Illinois Pipe Line Co.:	Trunk	1,639.34						
	Gathering	3,017.35	17,535,696	19,763,396	*2,312,537	39,611,609	51,632,933	9,837,207
		4,656.69						

Changes in mileage during year: Pumping station and 9 miles 6-inch line in Kentucky; 137 miles, 8-inch line, Yates to Del Rio, Tex.; 125 miles, 10-inch, Del Rio to Lytle, Tex.; 17 pumping stations. Total additions in Texas approximately $4,000,000.
*Includes property for general purposes $144,242; working oil stock $344,970.

Imperial Pipe Line Co., Ltd.:	Trunk	179.05	.....	1,227,803	.....	1,227,803	5,412,723	494,881

Approximately 75 miles of loops in course of construction in trunk lines and incomplete on date of report. No other important physical changes.

Indiana Pipe Line Co.:	Trunk	641						
	Gathering	274	496,198	4,604,812	3,120,469	8,221,479	27,247,830	1,443,811
		915						

Increase in trunk lines consists of minor changes of no material importance. Same applies to decreases in gathering lines.
Note—Established during 1928 following fund accounts to cover reserve for annuities and reserve for life insurance: Annuity fund $602,556.63; fire insurance fund $302,987.36; total $905,543.99.

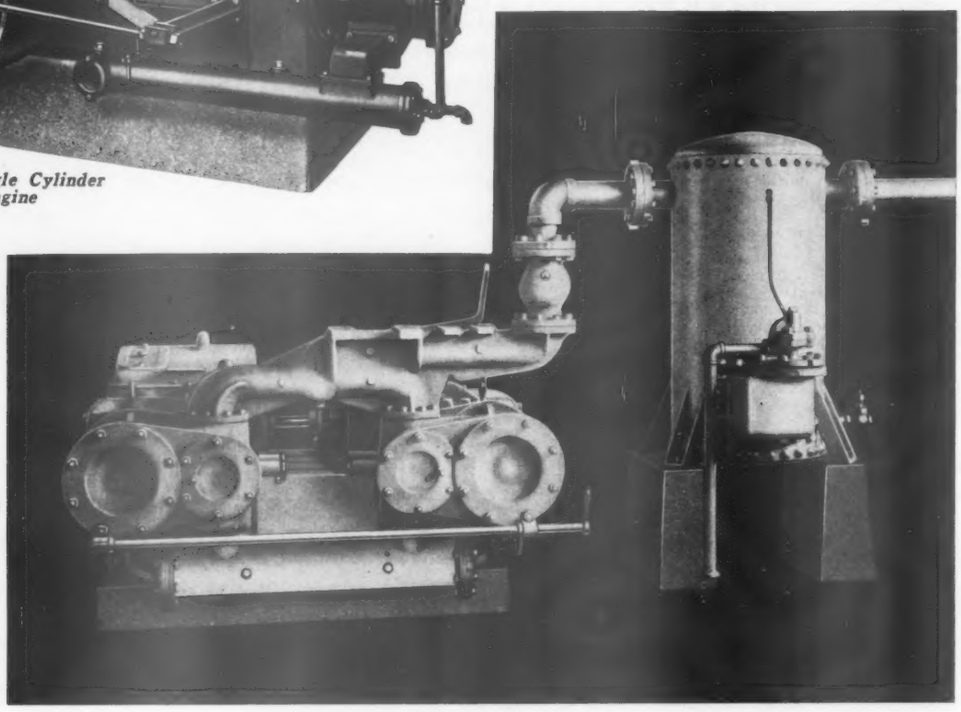
Magnolia Pipe Line Co.:	Trunk	3,512.76						
	Gathering	1,891.77	9,044,617	52,136,298	.....	61,180,915	115,607,890	19,215,958
		5,404.53						

Changes in mileage during year: 10-inch trunk line, Corsicana to Beaumont, Tex.; 8-inch trunk line loops, between Midland, Tex. and DeLeon; 5-inch trunk line loops between Maud, Okla. and Wewoka, Okla.; 8-inch trunk line loops between Purcell, Okla. and Duncan, Okla.; trunk line stations at Morita, Colo., Merkel, Conval, Iola, Wills and Cisco, Tex.

(Continued on next page)

AJAX Single and Twin

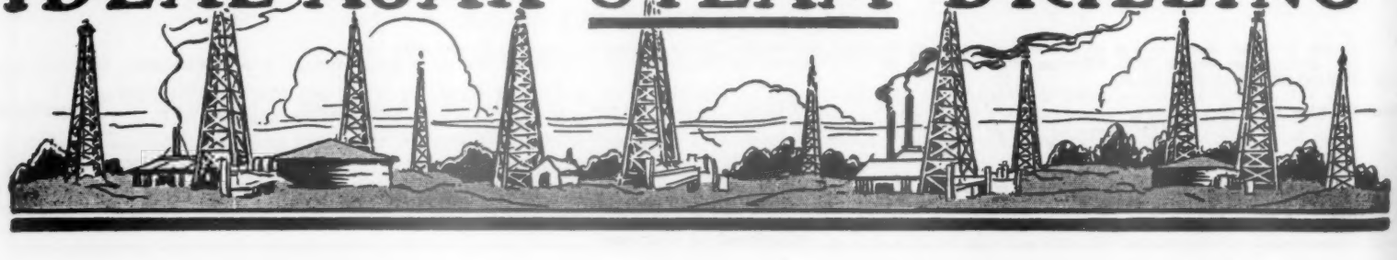
Ajax Single Cylinder Engine



Ajax Twin Engine with Separator.

THERE are several models of AJAX Engines for both rotary and cable drilling. They are known in every oil field in the world for efficiency and durability, and above all, speed in drilling.

IDEAL-AJAX STEAM DRILLING



Both Establish Records

AJAX Single Enclosed Engine at Oklahoma City.

IDEAL-AJAX Roller Bearing at St. Louis, Okla.

THE new Ideal-Ajax with roller bearings used in rotary drilling at St. Louis, Okla., shows speed and dependability that made the crew say: "When you crack down on the throttle of this roller bearing engine she sure gets away."

The Ajax Single Enclosed drilling a deep well at Oklahoma City, getting oil at 6400 ft. The performance of the engine both in speed and economy is one of many similar records in cable drilling.

Made by AJAX IRON WORKS, CORRY, PA.

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THE NATIONAL SUPPLY COMPANIES

NSCO

In every oil field.

ENGINES DELIVER POWER-PLUS

A SOLID WALL OF ABRASION RESISTANCE

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WHEN you apply hard-facing to your bit, you want the entire cutting surface protected from abrasion... not just spots here and there.

Blackor is the only hard-facing that is applied solidly... having no unprotected spots subject to abrasive wear. It presents a solid wall of abrasion-resistance and becomes a part of the steel... anchoring itself to the steel and eliminating the possibility of chipping or breaking off.

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Patent No. 1,613,942
Patent No. 1,424,536
Patent Reissue No. 17,323
Other Patents Pending

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The Super Abrasion-Resistant Facing

PIPE LINE CONSTRUCTION DURING 1928 (Continued)

Name of company—		Miles operated at close of year	Investment: Gathering lines	Investment: Trunk lines	Investment: Other lines	Investment: Total	Oil transported: Bbls.	Oil transported: Revenue
Marland Pipe Line Co.:	Trunk	250.74	2,812,517	3,556,990	210,767	6,369,507	15,288,683	1,369,931
	Gathering	381.04						
		631.78						
Changes in mileage during year: No extension of line.								
Maryland Pipe Line Co.:	Trunk	33.35	.....	161,719	170,000	331,719	.....	.....
Changes in mileage during year—None.								
National Transit Co.:	Trunk	937.34	3,901,073	4,845,138	6,384,037	15,130,248	14,185,699	723,310
	Gathering	2,726.13						
		3,663.47						
Taking into investment from suspended investment: Pure Oil pipe lines *$660,000; Corn Planter pipe lines *$25,000; Franklin-Ronsville 4-inch line, $28,660; total $713,660. *Sizes not mentioned.								
New York Transit Co.:	Trunk	121	*199,128	2,504,335	1,806,372	4,509,834	2,527,399	354,605
	Gathering	186						
		307						
Trunk lines: Laid approximately 2½ miles of pipe along Abbot Road, Buffalo, sizes not mentioned. Decreases in gathering lines consists of minor changes of no material importance, chiefly in small sizes of pipes (sizes not shown). *Active plant $1,118,735.47; transferred from active plant to idle plant, August 31, 1928, $1,584,726.99; total $2,703,462.46.								
Northern Pipe Line Co.:	Trunk	626.06	.....	3,157,914	779,177	3,937,092	5,607,349	487,224
Changes in mileage during year: Laid approximately 10¾ miles pipe, between Turkey City and Franklin, Pa. Size not shown. Note—Capital stock reduced from $4,000,000 to $2,000,000, authorized at special meeting held June 12, also reduction in par value from $100 to $50.								
Oklahoma Pipe Line Co.:	Trunk	1,180.51	6,654,044	17,573,074	1,487	24,228,606	69,607,820.30	10,586,691
	Gathering	1,049.00						
		2,229.51						
Changes in mileage during year: Approximately 12 miles of 8-inch and 15 miles of 6-inch gathering lines from new gathering stations to trunk line system. Increased gathering system in Marlow and Greater Seminole Pools. Took up and retired 134 miles of 6-inch gathering lines and 29.54 miles of 4-inch gathering lines. Constructed and equipped two gathering stations in Greater Seminole Pool.								
Pierce Pipe Line Co.:	Trunk	145.2	423,283	1,946,347	2,202,511	4,572,141	6,006,185	572,993
	Gathering	78.83						
		223.03						
Changes in mileage during year—None.								
Prairie Pipe Line Co.:	Trunk	5,238	27,470,334	67,639,341	70,456,992	165,566,667	126,837,320	34,879,918
	Gathering	7,096						
		12,334						
Changes in mileage during year: 8-inch, 15 miles, Cherokee to Bartlesville, Okla.; 16 miles, Cherokee to Turley, Okla.; 10 miles, Manuel to Cimarron, Okla.; 10½ miles, Crawford to Manuel, Okla.; 10 miles, Wolf Station, Okla.; 10½ miles, Seminole County, Oklahoma; 6-inch, 14 miles, Wewoka-Allen, Okla.; 36 miles, Maud (St. Potts discharge); 10 miles, Wewoka (Wewoka Park City); 14½ miles, Earlsboro to Okemah, Okla.								
Pure Oil Pipe Line Co.:	Trunk	177.79	1,716,820	206,185	132,846	2,005,851	7,837,000	766,767
	Gathering	171.47						
		349.26						
Changes in mileage during year—None.								
Pure Oil Pipe Line Co., Pa.	Trunk	269.95	.....	994,002	143,333	1,137,335	.....	.....
Changes in mileage during year: 19.45 miles 6-inch and 25.11 miles 8-inch pipe.								
Shreveport-El Dorado Pipe Line Co.:	Trunk	87.13	653,423	1,638,652	275,051	2,567,126	4,594,920	1,105,402
	Gathering	123.50						
		210.63						
Changes in mileage during year: Constructed approximately 19 miles of 6-inch pipe line from Carnie pumping station in Arkansas to the Rainbow Field, and 4 miles of 4-inch field lines in Rainbow and Smackover Field. Constructed two 80,000-bbl. steel storage tanks at cost of approximately $50,000.								
Sinclair Pipe Line Co.:	Trunk	4,260.2	12,216,110	65,800,488	6,294,736	84,311,334	75,329,616	2,783,575
	Gathering	6,750.4						
Changes in mileage during year: Allen-Byng 4-inch, disc line No. 1, Oklahoma; Allen-Byng 4-inch loop, Oklahoma; Salt Creek station and disc line, Wyoming; Maud station, disc line, Oklahoma; Tussey station, Oklahoma; Lost Spring station and district, Kansas; Allen-Newaka 4-inch and 6-inch disc line, Oklahoma; addition to Blake station, Oklahoma; Allen-Wood 6-inch disc line, Oklahoma; Maud-Tribbey 6-inch disc line, Oklahoma; Maud station, Oklahoma; Little River 6-inch disc line, Oklahoma; Missouri River crossing, Federal Territory; Wood station, Oklahoma; Maud-Earlsboro 6-inch disc line, Oklahoma; Grayback station, Texas; Grayback-Burnett 6-inch disc line, Texas; Ranger-Healdton 8-inch disc line, Texas; Drumright-Chicago 10-inch and 12-inch loop, Oklahoma, Kansas, Missouri, Iowa, Illinois and Indiana. Note—Changed: 13 units from Wyoming line transferred to Demmitt, Chicago, Ill. Retired Power Station, Texas.; Bristow station, Oklahoma.								
Shell Pipe Line Corp.:	Trunk	2,685	.....	41,012,974	.....	41,012,974	79,864,327	15,849,990
Changes in mileage during year: New lines constructed: McCamey, Tex. to Cushing, Okla. 10-inch, 487.39 miles; Cushing, Okla. to Wood River, Ill., 10-inch, 524.48 miles; Wood River, Ill. to East Chicago, Ill., Ind., 10-inch, 70.50 miles; Hendricks, Tex. to McCamey, Tex., 90.75 miles; Tonkawa, Okla. to Cushing, Okla., 6.04 miles; Marshall, Okla. to Covington, Okla., 20.72 miles; Key West, Okla. to Seminole, 1.50 miles; Little River, Okla., to South Seminole, Okla., 10.60 miles; Burbank, Okla. to Tonkawa, Okla., .15 mile; Yates, Tex. to McCamey, Tex., 19 miles; under construction, 10-inch pipe line from McCamey to Houston, Tex., 450 miles.								
Southwest Pennsylvania Pipe Lines:	Trunk	309.47	2,660,654	1,775,305	1,495,915	5,931,874	10,189,322	986,509
	Gathering	1,700.06						
		2,009.53						
Changes in mileage during year: Extension of pipe lines, $233,666.35. Oil tanks, $25,274.57. Dehydration plant, $9,031.41.								
Southern Pipe Line Co.:	Trunk	1,022.590	.....	5,418,224	1,172,926	6,591,151	2,373,272	381,814
Changes in mileage during year—None. Note—From the connecting lines of the Eureka Pipe Line Co. at the Pennsylvania-Virginia state line to Millway, Pa., where it connects with the lines of the National Transit Co. and the Pure Oil Pipe Line Co.								
Standard Pipe Line Co., Inc.:	Trunk	1,567.78	1,382,055	27,778,580	31,655	29,192,290	61,044,288	12,800,511
	Gathering	303.82						
		1,871.60						
Installed DeQueen Station, Ark.: One 1,000 horsepower W. E. motor, one Ingersoll-Rand pump, one electric switch board, one hot water heater and selector bells.								

(Continued on next page)

PIPE LINE CONSTRUCTION DURING 1928 (Continued)

Construction DeQueen Station, Ark.: Emergency light. Installed Wilton Booster Station, Ark.: One oil circuit breaker, selector bells, one hoisting crane, two 250 horsepower G. E. motors, two 6 by 18 B. T. pumps, one electric switchboard, one H. P. G. E. motor, one one-fourth by one-half Worthington pump. Construction Wilton Booster Station, Ark.: One machinery housing building. Rebuilt Wilton Booster Station, Ark.: Electric transformer stations.

Construction, Shreveport to DeQueen: One No. 9 copper wire for telegraph and telephone purposes. Wilton Booster Station to Ashdown, 12 miles telephone line.

Installation, Manderville Station, Ark.: One 1,000 horsepower G. E. motor, one Ingersoll-Rand pump, one electric switchboard, one hotwater heater, selector bells. Constructed, Mandeville Station, Ark.: Emergency light line, addition to station garage, pipe rack.

Installed, Fonke Booster Station, Ark.: One oil circuit breaker, selector bells, one 250-horsepower G. E. Motor, one Worthington pump, one electrical switchboard, one 1¼ by 2 Worthington pump, three 200 KVA 6,600/2,300 volt, single-phase, 60-cycle transformers; three 50 KVA, 6,600/2,300 volt, single-phase, 60-cycle transformers; two 48 KVA, 2,300/230-115 volt type "C" Westinghouse regulators.

Laid, Smackover Station, Ark.: 122 feet 2-inch pipe. Installed, Ida Station, La.: One F. & M. motor, pump attached; one DeLaval oil separator. Laid, Ida Station, La.: 221 feet, 1 inch 3-inch pipe; 231 feet 4-inch pipe. Enlarged, Moore Station, La.: Automobile repair shop and storage garage. Construction, Moore Station, La.: Fitting platform. Laid, Oxford Station, La.: 3,943 feet 6-inch pipe and 908 feet 8-inch pipe.

Construction, Rapides Station, La.: Pipe rack; Bunkie Station, warehouse unit; Anchorage Terminal, garage.

Installed, Flora Station and Anchorage, La.: Four telegraphones.

Construction, Caddo Station, La.: Septic tank; Lewis Station, La., 10-car loading rack. Installed, Lewis Station, La.: One 4½ by 16 Hill steam pump. Installed, Haynesville Station, La.: One 6 by 7 by 6 Gardner air compressor. Construction, Weller Station, La.: One 6 by 8-foot shed; motor-driven centrifugal water pump.

Laid: 1,556 feet, 7 inches 8-inch pipe, main line, Ida to Moore Station, La.; 190 feet, 4 inches 8-inch pipe, main line, Moore to Oxford Station, La.; 1,011 feet 6-inch pipe, main line, Caddo Station to Belcher Gate Plant, La.

Took up: 48 feet, 3 inches 4-inch pipe and 442 feet, 9 inches 8-inch pipe at Wilton Booster Station; 171 feet 2-inch pipe and 91 feet 10-inch pipe at Smackover Station, Ark.; 721 feet 2-inch pipe, 573 feet 4-inch pipe, 761 feet 6-inch pipe, 773 feet 8-inch pipe at Murphy "A" Tank Farm.

Dismantled: Two 10 by 4½ by 12 Cline pumps, three 11 by 5 by 12 Gardner pumps, one 10 by 6 by 10 Cline pump, one 6-horsepower F. & M. engine, 3 by 4 pump attached, at Murphy "A" Tank Farm.

Took up: 6,562 feet 2-inch pipe at Murphy "B" Tank Farm; 21,049 feet 4-inch line between Smackover Station and Murphy "H" Tank Farm; 419 feet 2-inch pipe, El Dorado Station, Ark.

Dismantled: One 30-horsepower boiler, one 45-horsepower boiler, two 6 by 4 by 6-inch pumps, two 10 by 6 by 10-inch pumps in El Dorado Field.

Demolished: One combination warehouse and office building in El Dorado Field.

Took up: 4 feet of 2-inch, 148 feet of 4-inch, 84 feet of 6-inch, 1,960 feet of 8-inch pipe at El Dorado Field, Ark.

Dismantled: One 6 by 7 by 6 Gardner air compressor, Lawson Station. Retired: Part of Kenova loading rack, Ark.

Dismantled: One Hill pump, Princeton loading rack; one 6-inch by 4 by 6 Worthington pump, Cotton Valley loading.

Demolished: Three small bunk houses, Haynesville Field. Took up 28 471 feet, 6 inches of 4-inch pipe, DeSoto Field.

Dismantled: One 12½ by 21 De La Vergne engine, two 7 by 12 Stover gas engines, one 7 by 12 National Transit Co. pump, one 3 by 4 Gould pump, two Bruner air compressors, one 3½ K.W. generator, one 10 by 6 by 12 Eagle duplex pump, one 100-bbl. steel tank at Turner Tank Farm, La.

Took up: 1,185 feet 2-inch pipe at Turner Tank Farm, La.; 2.90 miles 6-inch line, Vanada Tank Farm to Russell Tank Farm, La.; 2,765 feet, 3 inches 2-inch, 3,130 feet 4-inch, 2,100 feet 6 inches 6-inch, 1,348 feet 8-inch pipe at Russell Tank Farm, La.

Dismantled: Frannie pump house, telephone and telegraph equipment and one Moon turbin generator at Russell Tank Farm; one 5⅞ by 12 pump at Vanada Tank Farm. Took up: 413 feet 2-inch pipe at Vanada Tank Farm; 172 feet 2-inch pipe, 601 feet 4-inch pipe, 100 feet 6-inch pipe at Martin Tank Farm.

Dismantled: One 10 by 6 by 12 Eagle duplex pump at Martin Tank Farm, La.

Took up: 148 feet 4-inch pipe at Ida Station, La.; 3,996 feet 4-inch, 712 feet 6-inch, 196 feet 8-inch pipe at Oxford Station, La.; 5,764 feet 2-inch, 3 feet 6-inch, 134 feet 8-inch pipe at Lewis Station, La.; 7.23 miles 6-inch line, DeSoto-Oxford line, Bull Bayou gathering system; 1,556 feet 7 inches 8-inch line, Ida to Moore Station, La.; 188 feet 4 inches 8-inch line, Moore to Oxford Station, La.; 1,012 feet 10 inches 4-inch line, main line, Caddo Station to Belcher Gate Plant, La.

Preservatively treated: 50.40 miles 12-inch line, Moore's Station and Anchorage Terminal; 45 miles 8-inch and .20 mile 10-inch main line, Weller Station to Moore Station. Whatever changes necessary were made for the gathering of crude oil in gathering districts of Smackover, El Dorado, Caddo, DeSoto, Homer, Haynesville, Bellevue and Cotton Valley.

Name of company—	Miles operated at close of year	Investment: Gathering lines	Trunk lines	Other lines	Total	Oil transported: Bbls.	Revenue
The Texas Pipe Line Co. (Houston, Tex):							
Trunk, Texas	2,293.95	6,112,695	31,042,653	.....	37,155,348	*40,204,617	*11,117,112
Loop Lines, Texas	150.50						
Branch, Texas	193.71						
Trunk, La.	161.37						
Loop, La.	17.62						
Branch, La.	.11						
Trunk, Ark	33.74						
	2,851.00						
Gathering, Texas	1,140.65						
Gathering, La.-Ark.	64.38						
	4,056.03						

Changes in mileage during year—Extensions, Texas Trunk Lines: 45.35 miles 6-inch, Kingsville-Amarillo; 10.46 miles 6-inch, Kingsville-Lefors; †6.41 miles 6-inch, Houston-East Houston; †14.52 miles 6-inch, East Houston-Humble; 17.10 miles 6-inch, Wink to Monahans, 93.84 miles. 11.87 miles 8-inch, Kingsville-Lefors; 152.49 miles 8-inch, Lefors-Electra; 30.43 miles 8-inch, Olney-South Bend; .13 mile 8-inch, Sherman to Humble, No. 1; .13 mile 8-inch, Sherman to Humble, No. 2; 33.61 miles 8-inch, West Dallas-Reagor Springs; .09 mile 8-inch, Reagor Springs-Corsicana; 146 miles 8-inch, Corsicana-San Augustine; †6.41 miles 8-inch, Houston-East Houston, 381.16 miles.

Extensions—Texas Branch Lines: .14 mile 2-inch, Bunger Station-South Bend, .41 miles; 1.10 miles 3-inch, Bunger Station-South Bend, 1.10 miles; †1.63 miles 4-inch, Landreth Station-Waggoner Station; 4.67 miles 4-inch, Waggoner Station-Rio Bravo Station; .75 mile 4-inch, Fort Worth delivery system; 1.46 miles 4-inch, Dallas delivery system; .54 mile 4-inch, Beaumont delivery system, 9.05 miles; 6.84 miles 6-inch, Waggoner Station-Rio Bravo Station; †4.69 miles 6-inch, Winks to Hendricks "B"; .11 mile 6-inch, Fort Worth delivery system, 11.64 miles.

Construction: 155.0 miles 8-inch, trunk and telephone and telegraph line, Lefors to Electra; 30.4 miles 8-inch trunk and telephone and telegraph line, Olney to South Bend; 16.91 miles 6-inch line, Kingsville to Panhandle; 21 miles 8, 6 and 4-inch, connecting leases in Gray County; 33 miles 6-inch line and telephone and telegraph line, Kingsville to Amarillo; Lefors station and tanks; Bruce Bull Station; Waggoner and Meadows Station; 13.14 miles 6 and 4-inch, connecting Landreth, Waggoner and Rio Bravo Stations; 10,000-bbl. tank, Olney Station; 34 miles 8-inch trunk, West Dallas-Reagor Springs; telephone and telegraph facilities in Winkler, Crane and Upton Counties.; Milsap electrical station; 146 miles 8-inch line, Corsicana-San Augustine.

Installing: One 300-horsepower oil engine unit, Electra Station; One 340-horsepower oil engine unit, Fort Worth Station; three 340-horsepower oil engine unit, West Dallas Station; two 400-horsepower oil engine unit, Corsicana Station; Electric pumping unit and 20,000-bbl. tank, South Bend; one 100-horsepower oil engine unit, Ranger Station; three 100-horsepower oil engine units, Dobbin Station; one Gould pump and pump house, Sour Lake.

Purchase: Facilities in Crane and Winkler Fields; facilities at East Houston. Erecting: One 55,000-bbl. tank at San Augustine Station.

Notes—*Less interestate account barrels appear in state and interstate movement, 3,904,085 bbls. or grand total, 36,300,533 bbls. at $11,117,111.94. Add for transportation of oil in transit, $151,332.48; grand total revenue, $11,268,444.42. †Purchased from Landreth Production Co.

Name of company—	Miles operated at close of year	Investment: Gathering lines	Trunk lines	Other lines	Total	Oil transported: Bbls.	Revenue
The Texas Pipe Line Co. of Oklahoma:							
All lines	1,454.97	1,510,882	5,769,632	141,796	7,422,310	14,436,918	3,084,010
Trunk lines	597.98						
Loop lines	22.68						
Branch lines	119.39						
Gathering lines	603.81						
Gasoline lines	89.38						
Gas lines	21.73						

Changes in mileage during year—Construction, Trunk Lines: .62 mile 4-inch, Flat Rock tankage, Flat Rock Junction (additional); 9.08 miles 6-inch, Brayant Station, Seminole Junction; 12.63 miles 6-inch, St. Louis Station-Brook Station; 3.42 miles 4-inch, St. Louis Station-Brook Station; .43 mile 3-inch and under, St. Louis Station-Brook Station, 26.18 miles.

Branch Lines: .01 mile 4-inch, Youngstown Station, Wilcox Pool; .04 mile 4-inch, Bald Hill Station, Bald Hill Pool; .22 mile 4-inch, Davenport & Cosden Junction, Cushing Station; 3.60 miles 6-inch, Davenport & Cosden Junction, Cushing Station; 8.23 miles 8-inch, Healdton Pool, Wilson Station.

Gathering Lines: 2.64 miles 2-inch Youngstown district (additional); 5.44 miles 3-inch, Youngstown district (additional); .84 mile 6-inch, Youngstown district (additional); 6.92 miles 3-inch, Bald Hill district (additional); .02 mile 2-inch, Lamar district (additional); .03 mile 3-inch, Lamar district (additional); 1.26 miles 2-inch, Davenport district (additional); 5.82 miles 2-inch, Bristow district (additional); .19 mile 3-inch, Bristow district (additional); 1.01 miles 4-inch, Deep Fork district (additional); 3.89 miles 3-inch, Kiefer district (additional); .03 mile 6-inch, Kiefer district (additional); 1.27 miles 3-inch, Tulsa district (additional); .19 mile 4-inch, Tulsa district (additional); 1.01 miles 2-inch, Seminole district (additional); 1.32 miles 3-inch, Seminole district (additional); .31 mile 4-inch, Seminole district, (additional); .01 mile 2-inch, Earlsboro district (additional); .10 mile 3-inch, Osage district (additional); 4.59 miles 4-inch, Osage district (additional); .04 mile 6-inch Osage district (additional); .01 mile 2-inch, Tonkawa district (additional); .02 mile 3-inch, Tonkawa district (additional); .17 mile 3-inch, Burbank district (additional); .89 mile 3-inch, Wilson district (additional); .01 mile 4-inch, Wilson district, (additional); .57 mile 3-inch, St. Louis district; 1.91 miles 4-inch, St. Louis district; .02 mile 6-inch, St. Louis district, 40.53 miles.

Gasoline Lines: .01 mile 2-inch Zake Moore plant, West Tulsa; .42 mile 2-inch, M. Gooden plant, West Tulsa, .43 mile.

Gas Lines: .01 mile 6-inch. Cushing district; .13 mile 2-inch, Seminole district, .14 mile. Total lines constructed, 79.38 miles.

Lines abandoned: Trunk. 93.47 miles 4, 6 and 8-inch; branch, 9.70 miles 3, 4 and 6-inch; gathering, 56.25 miles 2, 3, 4 and 6-inch; gasoline, .90 mile 2-inch; gas, 1.79 miles 2, 3 and 8-inch; total 162.11 miles.

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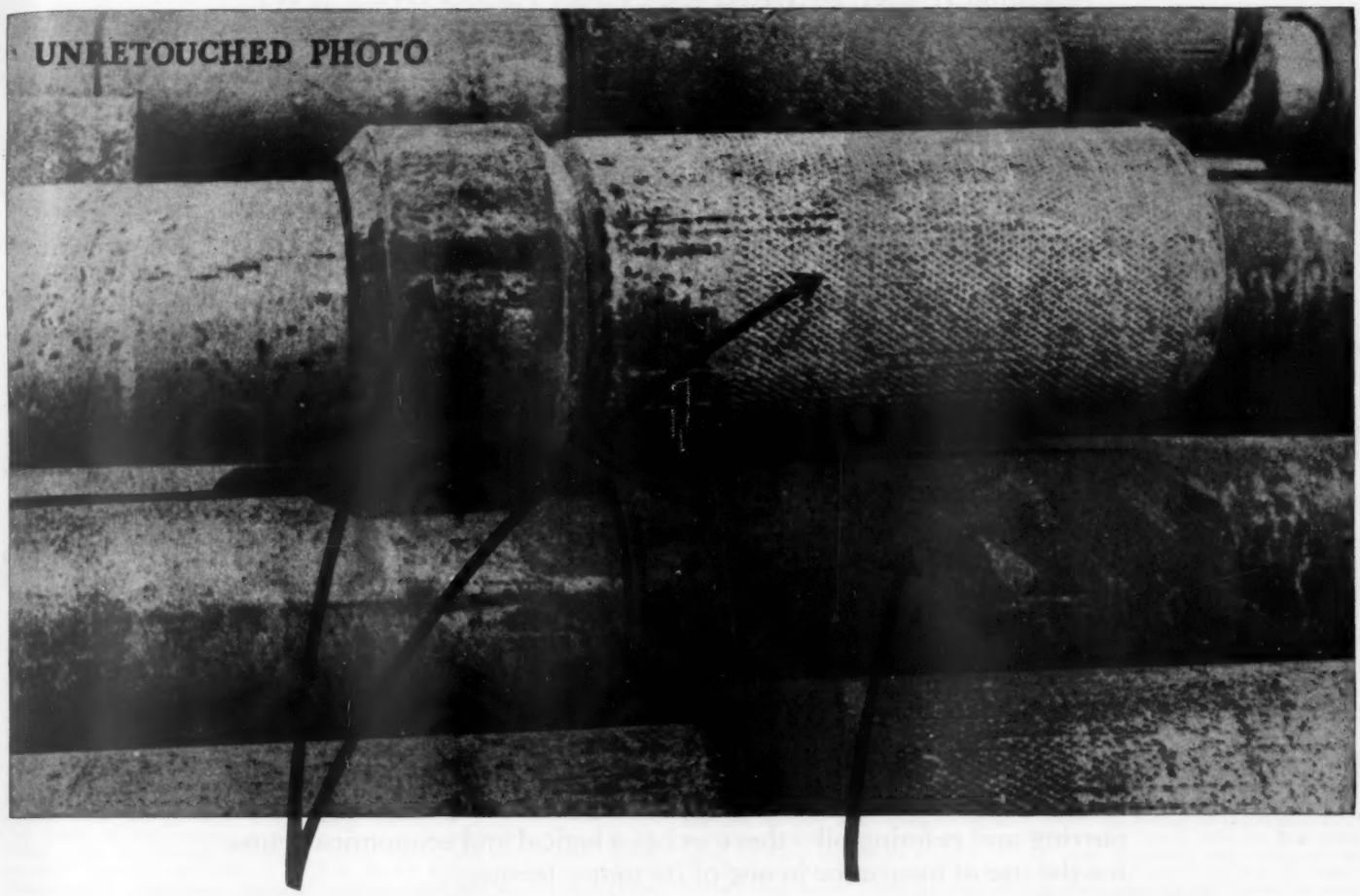

BETTIS PROTECTED

The Knurling isn't worn

NOT Bettis Protected

The Knurling is all worn away

Here's an unretouched photo of a string of 4" drill pipe taken at random in the Ventura, California, field. Part of the string was Bettis-equipped. Note the two tool joints that were Bettis-protected. All of the knurling is still clearly visible. Not the slightest abrasion shows. The two alternating joints were not Bettis-equipped and practically all of the knurling is worn off by abrasion with casing. You can duplicate this test in your own well. The result will be identical.

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New York Office: 39 Cortlandt St.

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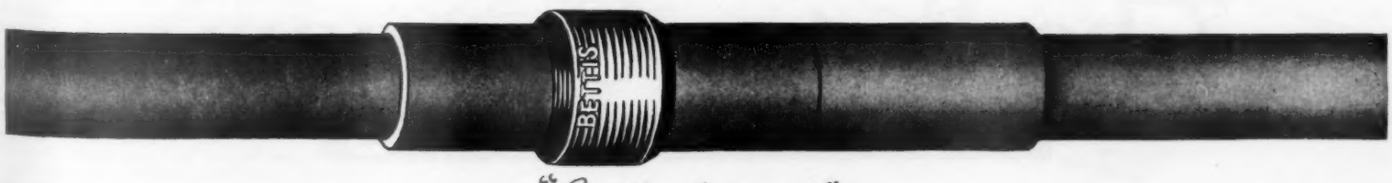

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Use and Occupancy (Business Interruption) Insurance

Wherever Capital is invested, wherever property and equipment is located or labor at work in the process of producing, transporting and refining oil—there exists a logical and economical cause for the use of insurance in one of its many forms.

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Stockholders invest their money because they expect a return on their investment. The usual fire, tornado and explosion policy will pay for the replacement of the destroyed property, but it will not pay a dividend on the invested capital, during the period of reconstruction. So the "Use and Occupancy," or "Business Interruption," policy was designed to fill this gap. This form of policy pays the profits that would have been made had the plant continued operation, plus all expenses which must continue during such suspension, in order to keep the organization intact.

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INSURANCE—BONDS

THIRD FLOOR
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PIPE LINE CONSTRUCTION DURING 1928 (Continued)

Name of company—	Miles operated at close of year	Investment: Gathering lines	Trunk lines	Other lines	Total	Oil transported: Bbls.	Revenue
The Tidewater Pipe Line Co., Ltd:							
Trunk	1,243.922	1,358,533	9,496,576	31,425	10,886.534	7,783,991	2,611,093
Gathering: Bradford Field	412.62						
Allegany Field	188.87						
Illinois Field	118.64						
	720.13						
Total	1,964.052						
Changes in mileage during year: None.							
Tuscarora Oil Co., Ltd.:							
Trunk	586.34	.....	6,624,817	45,000	6,669,817	5,966,169	280,921
Gathering	None						
Changes in mileage during year: None. (372.71 miles right-of-way.)							
Pure Oil Pipe Line Co. of Texas:							
Trunk	406.88	1,472,883	5,756,163	204,903	7,433,949	12,778,721	1,644,445
Gathering	390.39						
	797.27						

Changes in mileage during year: 323.36 miles of trunk and gathering lines, ranging from 2-inch to 8-inch in size and located in Wichita, Archer, Clay, Jack and Young Counties, were purchased March 1, 1928, from the Wichita Pipe Line Co.; 13.96 miles of gathering lines, ranging from 2-inch to 6-inch in size and located in Wichita and Archer Counties were purchased March 1, 1928, from the Prairie Pipe Line Co.; 9.14 miles of 2-inch, 3-inch and 4-inch lines, located in Archer County, were purchased March 1, 1928, from the Humble Pipe Line Co. The gathering stations in connection with the above lines were also purchased March 1, 1928, from the Wichita Pipe Line Co.
Note: Capital stock reduced by amendment to charter December 6, 1928, from $17,500,000 to $7,500,000. Amount outstanding at close of year, $5,000,000.

Colombian Line Tough Job Every Mile

No Outstanding Engineering Problems to Solve but Construction Under Tropical Conditions Was Hard Work

By A. E. Mockler
New York Bureau, The Oil and Gas Journal

: The Andian Pipe Line, which transports crude oil from the interior of Colombia to the harbor of Cartagena, represented one of the most difficult pipe line construction jobs on record, because of the nature of the country which it traverses and the climatic conditions under which the line was built.

Incorporated in 1919 under the laws of the Dominion of Canada, the Andian National Corp., Ltd., subsidiary of International Petroleum, holds a concession from the Republic of Colombia for 50 years, dating from October 1, 1923, for the construction and operation of an oil pipe line from the interior to Cartagena Harbor, with terminal facilities. The line is now in operation. The operating company owns harbor front property, pier and warehouses in connection with the concession, also acquired from the Colombian government, giving it valuable rights in Cartagena Harbor for a period of 20 years from July 1. The Mamonal terminal in Cartagena Harbor is a model of its kind.

The Andian pipe line system consists of a main line with single loops extending for a distance of 335 miles from the Tropical Oil Corp. fields at En Centro to Mamonal terminal on Cartagena Bay, its route following for the most part the course of the Magdalena River. In addition to the 335 miles of main line there are 280 miles of loop. The pipe is 10-inch screw end line of open hearth steel 21 feet to the joint.

Loop Laid in Six Months

Laying of the main line began on April 4, 1925, when the first joint was connected and it was completed March 6, 1926—this record being considered especially noteworthy as the work was done under tropical conditions. The loops were laid in slightly over six months and completed in June, 1927, thereby increasing the capacity of the entire system from 30,000 to 50,000 bbls. per day. The line starts at El Centro at an elevation of 322 feet and runs gradually downward to nearly sea level at Mamonal except that a high point of 260 feet is encountered about 5 miles from the terminal. To protect against rapid deterioration in the rich tropical soil, the pipe was coated with a priming paint of asphaltic base and this treated with an outer coat of oxidized asphaltum.

The appearance of the pump stations would satisfy the most exacting oil man. They are garden spots set down for the most part right in the midst of the tropical jungle. There are well-kept lawns and flower beds around station buildings and employes' dwellings. Pump houses and manifolds are immaculately clean and orderly.

Part of the pumping equipment is National Transit and part Prescott, driven by De La Vergne solid-injection Diesel engines, except that at El Centro pumps are driven by Westinghouse squirrel cage induction motors with current obtained from the Tropical Oil Co. There are four pumps at Mamonal Terminal, with a total rated capacity of 13,200 bbls. per hour.

Storage Capacity

Storage capacity up the line totals 965,000 bbls., with six tanks at El Centro, three at Galan and two at each of the other stations. In addition there are fifteen 80,000-bbl. tanks at Mamonal, with a total storage capacity of 1,200,000 bbls.

A fleet of launches is constantly moving up and down the Magdalena River conveying operating personnel and from time to time the company seaplane carries executives and superintendents on urgent missions. The company has also acquired its own river steamer, which makes periodical round trips with material, mail and commissary supplies.

The company maintains a medical and sanitary department. Since the start of construction the base hospital has been located at Calamar, but a new modern, fully-equipped hospital is now being built at the terminal across the bay from Cartagena, and the consensus of opinion is that it will be the finest hospital in Colombia. During 1928 the average time lost per employe due to sickness was 4.82 days. It is understood that six days per year per employe is a fair record in temperate climates.

The oil pumped through the Andian line in 1928 showed average gravity of 27.4 degrees, A.P.I., average temperature of 86 degrees Fahrenheit, and average viscosity of 134 seconds Saybolt.

The Andian line is a common carrier, operating under a specific tariff granted by the government of Colombia in conjunction with the pipe line concession.

With the loading of the tanker T. J. Williams on July 2, 1926, the first cargo of crude petroleum was taken out of Colombia and the oil fields of that country were definitely linked with the markets of the world.

Hard Work All the Way

During construction of the first pipe line an Andian official had this to say:

"It is a composite of the worst pipe line country found in Pennsylvania; of the swamps of Louisiana; of the rough territory of West Virginia. The distinction is that while in the States the rough going does not last the entire length of the line, in Colombia the job is a tough one practically every mile of the distance. There are no outstanding engineering problems to solve; there is no phase of the construction upon which we

(Continued on Page 322)

General plan of the pipe line of the Andian National Corp. in Colombia.

Technical Questions Answered

BY CHARLES K. FRANCIS, PH.D., TECHNICAL EDITOR

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible so as to assure a satisfactory answer.

All inquiries should be signed and if other than the given initials are to be used please indicate the desired letters.

Questions involving patented processes, intricate formulas and calculations and estimates of costs, for obvious reasons, cannot be answered. The replies will appear on this page within a reasonable time.

TREATMENT FOR FATIGUE OF METALS

Is there any way to treat metals that are used under strain and shock so that they will not break so much? We have much trouble with the sucker rods breaking and the strange part about it is that they usually break at the thickest part and close to the joint. Can you give me information about this?—S. B. A.

Sucker rods operating from no load on the down stroke to full load on the up stroke create a severe shock or stress, especially when the stroke is short and fast. The constant whipping or bending is the cause of the failures. The joint is naturally the stiffest point in a string of rods, due of course to the larger diameter, and the bending or flexing would naturally occur somewhere below the joint at a point where the taper fades into the rod. Failures at this point are more frequent than at any other part of the rod, and it is generally recognized as the critical point. Proper heat treatment has materially increased the strength of the sucker rods at this point.

There is a tendency to specify certain alloy steels for these rods and a comparatively large quantity of manganese is desirable. One company subjects these rods to a special heat treatment for the purpose of restoring the structure which has been disturbed during the manufacturing operations. When a bar of steel is made into a rod, disturbing strains are set up in the steel as a result of the gathering of the metal to conform to the moulding process to make the joint. Proper heat treatment relieves the stresses and rebuilds the grain structure so that the metal is returned to its normal strength.

A specially designed furnace is used for the heat treatment. The rods are slowly rotated by rollers as they pass through the furnace. The rotating of the rods insures uniform heating. It takes approximately one hour for a rod (one end only) to pass through the furnace. The furnace is divided into two sections; one section 30 feet long and the other section 20 feet long. The rods pass through the 30-foot section first and are subjected to a temperature of 1,575 degrees. After passing through the 30-foot section they are given an air blast, which suddenly lowers the temperature. Then they pass into the 20-foot section, and are given 900 degrees heat, which is called a drawing heat. When they have passed through this 20-foot section the heat treatment is complete. This furnace is fired by gas and the heat is controlled by electric pyrometers. When the furnace is once heated up to a fixed temperature it can be maintained to a degree for any period of time.

Regardless of the quality of the rod, all manufacturers are having more or less trouble with pin fractures. The break usually occurs at the point where the thread vanishes into the fillet at the base of the pin. Considerable research and many tests have proven that most of the pin breaks are due to the fact that the joint has not been made up tight. It is impossible to make a tight joint with the short handle sucker rod wrenches now generally used. If a point does not shoulder up, the pin must stand the flexing stresses or the whipping action of the rods when pumping. The result is sooner or later the pin will snap. Field tests have conclusively proved that when longer wrenches are used and the joints are made up tight, pin breaks have been reduced as much as 75 per cent. Some of the larger production companies have already adopted the use of longer wrenches. In several cases 36-inch wrenches have been used.

COMPOUNDED CYLINDER OILS

Will you please tell us the method for determining the compound in a steam cylinder oil, also the materials used in compounding and the significance of the compound in the oil?—C. C.

Lubricating, and certain special oils, which are made by blending vegetable or animal oils with mineral oil are known as compounded oils. The vegetable and animal oils contain organic acids which vary in kind and quantity with the source of the oil and the degree of purity. The quantity of organic acid is usually determined as oleic. Consequently when a vegetable or animal oil is mixed with a mineral oil the product will contain some organic acid.

As you know, the organic acids are considered to be inactive as corrosive agents when in contact with metallic surfaces. They have the property of forming emulsions in the presence of water and for this reason are desirable when an emulsifiable oil is wanted, as for steam cylinders, cooling and cutting oils. Another reason for the use of oils containing organic acids is that they have a tendency to increase the oiliness of an oil and cause it to adhere to the metal so that the lubricant will maintain a film between moving surfaces. The presence of vegetable and animal oils tends also to raise the viscosity of an oil, and as these oils frequently retain viscosity when heated they are considered to be adapted to conditions where the parts are exposed to high temperatures.

Numerous oils of vegetable and animal origin are compounded with mineral oil; these include rapeseed oil, castor oil, tallow and lard oils. Probably more rapeseed oil is mixed with mineral oil to be used for lubricating purposes than any other organic acid oil.

The presence of a vegetable or animal oil may be considered certain when the acid value test indicates the presence of organic acids. As suggested above, the quantity of acid is usually reported in terms of oleic acid, and while other organic acids are usually present, it is important that the absence of a mineral acid be assured by the ordinary tests. Identification of the kind or kinds of acid oil may require extended examination; experience with such oils is of value because the expert may recognize many of these oils by color, odor and taste, or by means of a few physical and chemical methods.

HYDROGENATION PROCESS FOR GASOLINE

Will you favor me with a simple explanation of what appear to be serious claims that plants are being built for the purpose of making 100 per cent gasoline from crude oil by what is called the hydrogenation process?—T. H. A.

The Standard Oil Co. of New Jersey is reported to be building two plants, one in New Jersey and the other in Texas, where the hydrogenation process will be applied to the treatment of heavy crudes and yields of 100 per cent gasoline are expected.

The hydrogenation process was developed in Germany under research projects conducted by the I. G. Farbenindustrie. These investigations have resulted in processes for the extraction and fixation of nitrogen, from the atmosphere for the preparation of explosives and fertilizers; the synthesis of wood alcohol, and the preparation of a motor fuel from coal. The German company manufactured 300,000 bbls. of gasoline by the hydrogenation of coal last year.

For several years research work has been under way by the Standard Oil Co. of New Jersey and as a result of their investigations an arrangement has been made with the I. G. Farbenindustrie for use of the process in the United States.

There are a number of refineries reporting yields of 60 per cent gasoline by combined skimming and cracking, and many authorities agree that yields of 80 per cent are possible. In the cracking operation there is a breaking down of the heavier parts of the oil into lighter products and at the same time there is formed a large quantity carbon, coke, or heavy oil. The reason for this is that there is an excess of carbon beyond that required to make the lighter product, gasoline. The hydrogenation process adds hydrogen to the carbon, so that in theory there should be no carbon deposits like those which are a product of the cracking process. The process is said to be especially suitable for the conversion of heavy fuel oils of an asphaltic character, and if this proves to be commercial it will have an important influence on the fuel oil problem, the supply of fuel oil at the present time being in excess of market demands.

TOWERS AND STABILIZERS

Is it known who invented the first tower, and what was the nature of the construction, for use in separating the products from oil and in making natural gasoline? What is considered to be the best form of tower at this time? What is a stabilizer?—T. R. K.

The tower as used in the distillation of liquids is of very ancient origin, as may be found from the examination of the early records describing the purification of water and the preparation of alcoholic liquids. Its first use in the petroleum industry is not clearly established. You will find an extended article, "Fractionation in Modern Refining," by George A. Burrell, in The Oil and Gas Journal for February 24, 1927, placing the first attempts at rectification as early as 1832. The material below is quoted from this article.

Efficient columns of today in refineries arrived through all sorts of fractionating devices. Just a sloping pipe from the still, then columns of all kinds; filled with rocks and other fillings, baffle plates, sieve plates, etc. Towers like the Van Dyke, Gray and Van Tilburg towers have been extensively used. These were mainly fractional condensation towers. Old-type towers through their inefficiency have cost the refiner millions of dollars in rerunning and other costs.

Rather recently good spaced fillings have appeared like the Raschig, Lessing and Breaget fillings. The function of a filling is to distribute the vapor and liquid uniformly through the column, bring the two into intimate contact in a minimum of space and break the fluids up into fine particles. The bubble column does this very well.

Refiners take several cuts from a tower in many instances, it is true. But this is because they are satisfied with the results obtained. However, if instead of taking gas oil, say from the base, kerosene from the middle and gasoline from the top of a single tower (assuming three cuts are desired) if an additional tower be installed, gas oil taken from the bottom of the first, kerosene from the bottom of the second and gasoline from the top of the second, sharper fractions will be secured, i.e., less gasoline in the kerosene and less kerosene in the gas oil. The latter is more important at the moment.

The same principles as the above apply to natural gasoline plants, except that only one column is necessary. One does not have the elaborate "hookups" of towers and liquid and vapor heat exchangers one has in a refinery.

Rectifying columns are called stabilizers in the natural gasoline industry. This term for a while clouded the real purpose of the columns, for the natural gasoline industry, even more so than the refining industry, generally speaking, understood little about the art of rectification in its earlier years. It is a much younger industry. But when one rectifies or stabilizes natural gasoline, he is doing just exactly what the refiner does when the latter puts his distillate through a bubble column, namely, makes sharp separations. Further, if the bubble tower is best for straightrun gasoline it is best for natural gasoline. The only difference is the natural gasoline operator handles a more volatile material and he is forced by the physical properties of natural gasoline to adopt different temperatures and pressures in his column than the refiner uses.

DIESEL TYPE MOTOR

Why is the Diesel engine considered to be an improvement over the common form of motor for automobile and airplane use?—R. C. M.

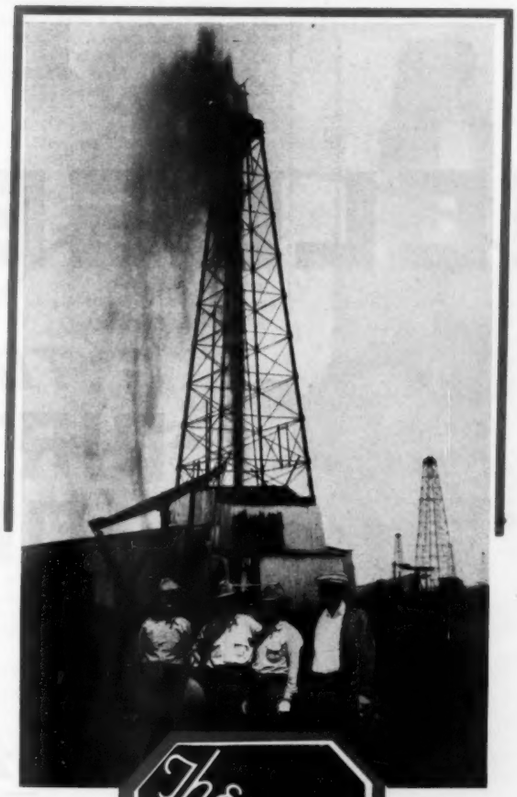
Some of the principles and the recent development of the Diesel engine have been discussed on this page in the issues of January 19 and October 11, 1928, also May 19, 1927.

A complete history of the Diesel engine may be found in Diesel Engines, by Morrison.

The distinguishing principle of this form of engine from other internal combustion engines is the compression of a charge of air until the temperature of compression becomes great enough to ignite the fuel without the aid of external device. The oil is forced into the combustion cylinder under high air pressure. Some engines of this type have been modified so that the fuel is introduced by means of a pump.

The features which place the true Diesel apart from other oil engines are—Compression sufficient to produce autoignition of the fuel; injection of the fuel by an air blast; combustion with practically no change in pressure from the maximum compression pressure.

The Diesel engine has been used in marine service, and to some extent in locomotives, because of the power possibilities for the space required and the low cost of the fuel. The efforts to adapt this type of engine to the automobile and to aircraft have centered about weight and it has been announced that a lightweight engine has been made.



The HIGHER STANDARD

To Drill the World's Deepest Wells

DRILLED with Spang Weldless Jars, the Texon Oil & Land Company's well—University 1-B, in the Big Lake field—reached 8523 feet before the gas flow stopped the drilling. Total drilling expense was less than $200,000. In all fields, domestic and foreign, Spang Weldless Jars are standard Equipment. Over 300 leading Supply Stores carry them in stock.

SPANG & CO. . . . . BUTLER, PA.

SPANG

WELDLESS JARS

ENCLOSED

TO KEEP -DIRT OUT -OIL IN

TITUSVILLE OIL COUNTRY
TITUSVILLE
MACHINERY
BUILT WITH RESERVE RUGGEDNESS

HERE'S THE ENGINE OIL MEN PREFER

For added efficiency the crankshaft is mounted on Timken Roller Bearings.

AND they prefer TITUSVILLE ENGINES because its well known that they will deliver the goods. Long service is assured as every moving part is sealed in a bath of oil. They are the best oil field engines that good materials and careful construction can produce.

THE TITUSVILLE IRON WORKS
Division of Struthers Wells-Titusville Corp.
TITUSVILLE, PA.

For Export
The Continental Well Supply Co.
72-76 Trinity Court,
New York City, N. Y.

Distributors
The Continental Supply Co.

For California
California Machinery Supply Co.
2449-55 Hunter St.,
Los Angeles, Calif.

TIW-19

TITUSVILLE

12"X12" ROLLER BEARING STEAM ENGINES

EASTERN FIELDS

(Continued from Page 71)

ser good for 500,000 feet. In a way this well may be regarded as a wildcat.

Perry County

In the NE Section 34, Coal Township, Perry County, the Hope Construction & Refining Co. has a light pumper in the Clinton sand at No. 5 on the Edward L. McCune farm. In Section 1, Bear Creek Township, Clyde Foraker has a light gasser in the Berea grit at a test on the John Lucas farm.

In the NE Section 18, Ward Township, Hocking County, the Hope Construction & Refining Co. has completed in the Clinton sand No. 5 on the James M. Tracy heirs' farm. It produced 15 bbls. the first 24 hours. At Boling Mills, Section 4, Vinton County, the Cooperative Co. has completed in the Berea grit a test on the Cameron Clark farm. It is a 15-bbl. pumper.

In the NW Section 34, Coal Township, Perry County, the Hope Construction & Refining Co. has completed in the Clinton sand No. 6 on the Edward L. McCune farm. It produced 45 bbls. the first 24 hours. In Section 8, C. S. Hickey & Co. have completed in the Pecker sand a second test on the W. S. Ellis farm. It is a 15-bbl. pumper.

In the SE Section 27, Wayne Township, Monroe County, W. O. Latimer & Co. have completed in the Maxon sand No. 3 on the Lewis Stegner farm. It is a 3-bbl. pumper. In the SE Section 8, Bowling Green Township, Licking County, the Ohio Fuel Supply Co.'s second test on the Berton E. Cooperrider farm is a light gasser, spraying a little oil from the Clinton sand.

Vinton County

In Section 3, Knox Township, Vinton County, W. J. Sperry, trustee, has a 4-bbl. pumper in the Berea grit at a second test on the Harvey Brooks farm. In Lot 88, same township, Gross & Frebault have a gasser in the same formation at a test on the N. E. Beasley farm. In Knox Township, Koontz and others are drilling a second test on the John Martin farm.

In Section 1, Perry Township, Licking County, the Kundtz-Hultz Co., Inc., completed in the Clinton sand No. 10 on the Joseph Chaney farm. It is a 25-bbl. producer. In the NW of Green Township, Hocking County, the Griffin Producing Co. has a fair gasser in the Clinton sand at a second test on the D. Nutter farm.

On Whipple Run, Section 126, Fearing Township, Washington County, F. D. Meister & Co. have a light pumper at No. 10 on the William Berg farm. On Good Hope Ridge, Section 76, Salem Township, Meister & Blair completed a light pumper in the Macksburg 500-foot sand at No. 6 on the Meister-Blair farm.

In the NW Section 18, Sutton Township, Meigs County, the Preston Oil Co. has a 5-bbl. pumper in the Berea grit at a test on the George J. Reefer farm. In the same section, the Twenty-Five Association, Inc. is starting No. 13 on the William Carnahan farm.

In Section 10, Franklin Township, Monroe County, the Preston Oil Co. has completed a test on the Ernest Mallett farm. It is a gasser in the Berea grit good for 600,000 feet. In Section 3, same township, Lucas and others have completed a second test on the B. H. Hines farm. It is a light gasser in the same formation.

Licking County

In Fallsburg Township, Licking County, the Preston Oil Co.'s No. 6 on the Waylan Ashcraft farm is a light pumper in the Berea grit. In Lot 10, Madison Township, the Preston Oil Co. has an 8-bbl. pumper in the Berea grit at a test on the Charles Stasel farm.

In the SE Section 6, Green Township, Hocking County, the Arkansas Fuel Oil Co. has completed and shot in the Clinton sand No. 6 on the Snider heirs farm. It is a 10-bbl. pumper. In the Fisher Pool, Section 12, Athens County, the Ohio Fuel Supply Co. has completed a test on the C. W. Winget farm. It is a gasser in the Clinton sand good for 2,000,000 feet.

In Section 24, Washington County, Frank Creighton and others have completed a second test on the Zelman Ludington farm. It is a 5-bbl. pumper in the Peeker sand. In Section 36, Newport Township, the Parson & Sweeney Oil Co. has completed in the Keener sand No. 5 on the A. E. Mendenhall farm. It is a duster.

In the NW of Lot 26, Harrisville Township, Medina County, Ray C. Jones has completed No. 3 on the A. D. Falkner farm. It is a 4-bbl. pumper His No. 2 on the same farm and in the same township, has been completed also as a 4-bbl. pumper. In Section 22, Lake Township, J. L. Smith and others have a light gasser at a test on the Golf Club grounds. In Section 9, same township, I. C. Robinson & Co. have a duster in the Berea grit at their No. 5 on the G. W. Heffelfinger farm.

SOUTHWEST PENNSYLVANIA

The southwest Pennsylvania fields completed few wells. In Springhill Township, Greene County, the Herold Run Oil & Gas Co. completed a gasser in the Fifth sand on the J. A. Dye farm. In Greene Township, Greene County, J. L. Garard has completed in the Dunkard sand a test on the H. C. Barb farm. It has a little show of oil and will be tested.

In Buffalo Township, Butler County, the following wells have been completed: Heck & Co.'s No. 2 Andrew Cole, gas; Reimer & Co.'s No. 2 Johnston, gas; E. A. Bream & Co.'s No. 10 J. F. Trees, gas, and Heck & Co.'s No. 2 Shook, gas, in the 100-foot sand.

BUILDING OF RAILROAD TO OIL AREA APPROVED

The Interstate Commerce Commission has been advised in a proposed report to authorize the Yates & West Texas Railway Co., a new company, to construct a 43-mile line of railroad in Upton, Crockett, and Pecos Counties, Texas.

The proposed report, filed by Examiner M. S. Jameson, also recommends that the request for permission to retain excess earnings of the proposed line be granted.

The line proposed to be built would extend from a point on the Kansas City, Mexico & Orient Railway of Texas at or near Rankin, southerly via Iraan, to Sheffield, all in Texas.

The authorization recommended would be given over the objection of the Orient line, a part of the Santa Fe system, if the commission should adopt the proposed report. The Orient, by its intervention in the proceeding, contended that if the commission should find that a line should be built, the Orient should be allowed, because of its operations in that portion of Texas, to build it. It was argued, however, that there was no present need for the proposed construction.

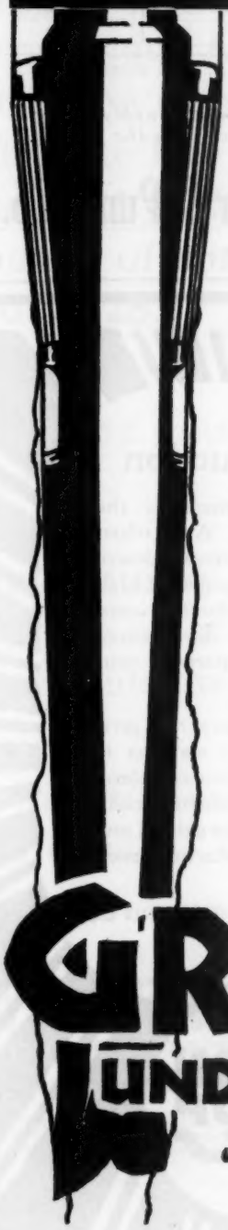
The examiner recommends that the applicant, having initiated the proposal, should preferably be given permission to build and operate the line. The connection of certain of the incorporators of the applicant railroad with oil companies or the oil lands to be served by the proposed construction does not constitute control of the applicant by an industry.

"The oil field, which the line of railroad would serve," Examiner Jameson states, "has a proven acreage of approximately 1,600 acres, and is conceded to have the largest potential production of any field in the United States. The ultimate recovery was reckoned by witnesses at 200,000,000 to 500,000,000 bbls., and even as high as 800,000,000 bbls. when computed on the basis of its initial production compared with that of the Big Lake Field, lying 50 or 60 miles north of Yates."

ANNUAL MEETING IN CALGARY

The Rocky Mountain Oil & Gas Association will hold its fifth annual convention, in conjunction with the Alberta Oil and Gas Association, in the Paliser Hotel, Calgary, Alberta, September 19, 20 and 21. The program includes a trip to Turner Valley, a golf tournament and a visit to Banff and Lake Louise, besides the usual business sessions. There will also be a banquet, dance and cabaret. Four floors of the hotel have been reserved for the American delegation.

A foreign Shipment



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WORLD wide popularity only comes through proven merit. And only a continuous record of safe, satisfactory performance can keep that popularity.

If a steady flow of foreign repeat orders have significance then GRANT Underreamers are surely rendering that kind of performance.

Have you used one?

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GRANT UNDERREAMERS

"Used where performance counts"

MILLER

Emergency Pipe Clamp

THE Miller Emergency Pipe Clamp is designed to stop leaks in water, gas, steam or oil lines.

The clamp is easily handled, quickly put in place, and will stop a leak in less time and with less trouble than any other clamp made.

You do not have to use expensive packing as any old piece of inner tube or a piece of belting will make a good gasket.

One trial will convince you that the Miller Emergency Pipe Clamp is not only the best clamp on the market but also the most inexpensive.

Size	Weight	List Price
2" x 4"	2½ lbs.	$1.00
2" x 8"	5½ lbs.	$1.75
3" x 6"	6 lbs.	$2.00
4" x 6"	7 lbs.	$2.40

Prices F. O. B. Destination

Sold by the leading Supply Stores or direct from the

Miller Combination Bailer & Pump Co.

Sapulpa, Oklahoma

Safeguard Production

YOUR production equipment is the guardian of your profits. And when your production machinery breaks down, your profits are open to the ravages of high repair bills and excessive production costs. Steady production can only be insured when the vital, load-bearing parts of your equipment are drop forgings.

Champion Drop Forgings have the give-and-take strength and sturdy stamina to stand up under the punishment of relentless oil field service. Their performance in vital production equipment has gained and held the confidence of production men throughout the oil industry.

THE CHAMPION MACHINE & FORGING CO.
Cleveland, Ohio

CHAMPION DROP FORGINGS

PETROLIA IS STILL IMPORTANT POINT

(Continued from Page 82)

is exceedingly lucky to have natural gas with a high helium content, as the use of this kind of gas in the big bags does away with 90 per cent of the danger by fire and makes dirigible flying and experiments much safer than when hydrogen is used. Helium is said to be far superior to any other kind of gas in lifting balloons and dirigibles. It has thirteen-fourteenths the lifting power of hydrogen, but leaks out eight times slower than hydrogen, therefore being much more economical to use, especially in long flights.

The Petrolia Field is perhaps one of the most unusual in the country due to the fact that the gas has a rather low heat content and at the same time an unusually high gasoline content for what is common called dry gas. The low heating value is due to the high nitrogen content. Usually with low heat content gas, the gasoline is also very low.

The field is not a continuous formation. It appears that it is composed of a series of lenses, and it is doubtful whether all of the lenses that exist in this territory have been found, but continued drilling will prove up all of the producing area, although many dry holes will no doubt be sunk before that time.

Large Plant in Old Field

At the present time the Petrolia Field has very little production, yet the Petrolia station is one of the outstanding units in the Lone Star Gas Co.'s system, and the third line is now being built from the station to Fort Worth and Dallas. This is a 20-inch line, 135 miles long and to cost more than $1,000,000. This will make the third line from the station to these cities, and the three lines are tapped at the various towns along the right of way for furnishing gas to those places.

Instead of compressing the gas from the local field, as was done in previous days, it has for its suction two 12-inch lines from the Chickasha Field in Oklahome and one 18-inch line from the field at Shamrock, Tex. The gas supplied through these lines is compressed and transported by the present 10 and 16-inch lines running to Fort Worth and Dallas, and the new 20-inch line will handle a still greater amount when it is completed. Work is now progressing from both ends of the divisions and it is expected the line will be completed in about 45 days.

The Petrolia station was erected under the supervision of C. M. Baker, who was chief engineer, and B. L. Rogers, who was made assistant to Mr. Baker after Arthur J. Meyers left the company. Later R. L. Shipp was promoted to chief engineer, and W. H. Jeffries, assistant chief engineer.

Although the Petrolia Field is of minor importance in the gas and oil industry at present, it is still necessary for the company to maintain a payroll of approximately 100 men. Mr. Shipp has been at the Petrolia station for 15 years. He is from Johnston, Ohio.

The company maintains a hotel at the compressor station in addition to the 36 cottages, the hotel being occupied by single men and run under the supervision of the company.

COLOMBIAN LINE IS TOUGH JOB EVERY MILE

(Continued from Page 317)

have not already had the experience of other pipe line jobs to guide us. It is just hard work all the way."

Communication is carried on over the company's own telephone line but, on account of frequent interruptions in the service due to climatic and other conditions, plans are now being completed to have communication augmented by radio installations.

The first modern office building is being constructed by the company in the city of Cartagena, and is now nearing completion. It will be a six-story structure, two floors of which will be used by the company's executives and staff in Cartagena, while the balance of the space will be leased to others, among which are the Tropical Oil Co. and the Royal Bank of Canada.

Dredging of the Boca Chica Channel at the entrance to Cartagena Harbor, which was recently completed, now makes it possible for the largest oil tankers to call at Mamonal for cargo.

Capt. James W. Flanagan, president of the Andian, was the chief figure in securing the pipe line concession from the Republic of Colombia. Captain Flanagan is a cosmopolitan figure who possesses a varied and extensive experience

Capt. James W. Flanagan
President of the Andian National Corp., Ltd.

in Mexican, Central and South American affairs. He has been in command of construction and operations in Colombia since the inception of the pipe line project.

Daniel O. Towl, vice president, and an outstanding member of the famous Towl family of pipe line engineers, designed the line and has been in executive

Daniel O. Towl
Vice president, Andian National Corp., Ltd.

charge of engineering in connection with construction and operation.

Merrill M. Stuckey, manager and chief engineer of the Andian in Colombia, made the original detailed survey and carried through the entire campaign of construction. Mr. Stuckey's previous experience in pipe line construction in the United States equipped him with proper grasp of the business.

Sir Herbert Holt, Montreal, is chairman of the board of Andian National Corp., Ltd. Other officers, besides Captain Flanagan, president, are G. H. Smith and D. O. Towl, vice presidents; A. H. Weisberger, secretary-treasurer, and H. A. Burgon, assistant secretary-treasurer. Directors are as follows: Sir Herbert Holt, J. W. Flanagan, G. H. Smith, D. O. Towl, Hon. Hugo Baring, O. B. E., of London; Maurice Boyer of Paris, France; Otto Donnell, Findlay, Ohio; G. W. Carpenter of New York, and C. E. Neill of Montreal.

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Today's prosperity in the Oil and Gas Industry is reflected in its advertising!

Following a more or less even trend of comparison for the first four months • • • • the advertising space carried in The Oil and Gas Journal since April has exceeded every month of the corresponding period of 1928 and to date The Oil and Gas Journal has exceeded by MORE THAN 100 pages the amount of space carried in the same period of 1928.

The Total Increase Has All Occurred in the Last 4 Months.

The Petroleum Industry, thru The Oil and Gas Journal, is the most profitable market for concentrated sales work.

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CHICAGO L. Austin de Vore Peoples Gas Bldg.
LOS ANGELES C. R. Johnson Petroleum Securities Bldg.

A BIT OF PERFORMANCE

One bit made *15* holes Another seven!

(Quite a bit, eh?)

The illustration above shows a 9¾" primary bit with a 17" super-imposed head. If the formations or drilling conditions in the field make it advisable to drill a hole say 6" in diameter as a primary or rat hole then with the same size blades and reamers in this type of construction, you can, by using the same size blades and reamers, in a super-imposed head, drill a hole of 12" in diameter and can step this up to 18" by a third step or by using the reaming blades only as a super bit.

The illustration below gives you the bottom view of the K-P Super-imposed Head before screwing on a regular K-P Straight Hole Bit.

"The K-P bit that drilled the discovery well in the new field at Sequin, near San Antonio, Texas, has drilled *fifteen wells!*" says M. O. Brink, driller, in a letter written to John Sigmund, Contractor of Aransas Pass, Texas, on August 4, 1929.

"This well was drilled for the Texas Company from top to pay by 'Red' Connors. 'Red' has another Kennedye-Plumb bit which has made *seven wells!* 'Red' says: 'It would have taken a train-load of fish-tail bits to make as much hole as I have made with these two K-P bits. Outside of a slight cutting in the water course, these two babies are okay'."

Have You Got the Dope on the New K-P Super-imposed Head?

Kennedye-Plumb, after a lot of research, as well as practical work in the field, the purpose of which was to determine just what thickness of blade would continue to cut or penetrate and still have sufficient strength to withstand the terrific shocks encountered in drilling, has put out the new "K-P Super-imposed Head." Write for circular 814 giving the low-down on it.

KENNEDYE-PLUMB CORPORATION

St. Louis, Mo., U. S. A.

"The Line of Least Resistance"

GULF COAST FIELDS AND WILDCATS

(Continued from Page 54)

Yount Lee Oil Co.'s No. 2 Woodward (southeast) ..... Rig.
Yount Lee Oil Co.'s No. 3 Woodward (southeast) ..... Derrick.

BOLING—FORT BEND AND WHARTON

Sun Oil Co.'s No. 8 E. C. Farmer ..... To test cap rock for sulphur 1,321 ft.
The Texas Company's No. 2 Pleasants, northwest ..... Drlg. hard sand and shale 4,094 ft.
Vacuum Oil Co.'s No. 3 Taylor, south side ..... Bailed dry; sand 3,940 ft.; pulling screen to deepen.

RACCOON BEND—AUSTIN COUNTY

Humble & Valley's No. 5 Hardy ..... Reaming 3,222 ft.; sandy shale.
Humble & Valley's No. 3 Buchanan ..... Cement casing 3,414 ft.; to test oil sand.
Humble Oil & Refining Co.'s No. 2-B Mitchell ..... Drlg. sticky shale 2,898 ft.
Humble & Valley's No. 3 Mitchell ..... Rig.
Humble & Valley's No. 1-B Walton ..... Drill plug to test oil sand 3,453 ft.
Humble & Valley's No. 4 Walton ..... Drlg. sticky shale 2,834 ft.
Humble & Valley's No. 5 Walton ..... Derrick.
Humble & Valley's No. 4 Dietrichs ..... Drlg. sand and lime 3,388 ft.
Humble & Valley's No. 5-A Deitrichs ..... Drlg. rock 166 ft.
Humble & Valley's No. 1 Jackson ..... Fishing 3,127 ft.
Humble & Valley's No. 2 Jackson ..... Drlg. hard sand and lime 600 ft.
Humble & Valley's No. 4 Austin College ..... Setting tubing 3,432 ft.; to pump.
Humble & Valley's No. 1 Graneau ..... Location.
Humble & Valley's No. 3 Bellville School ..... Derrick.
Humble & Valley's No. 2 Woodley ..... Drlg. sticky shale 3,300 ft.
Humble & Valley's No. 3 Woodley ..... Derrick.
Humble & Valley's No. 2-A Grawunder ..... Drlg. sticky shale 3,076 ft.
Humble & Valley's No. 3 Grawunder ..... Drlg. shale 981 ft.
Humble & Valley's No. 2-C Grawunder ..... Drlg. lime 790 ft.
Humble & Valey's No. 3 Reese ..... Swabbing 3,516 ft.
Humble & Valley's No. 4 Gotosky ..... Comp. flowing 372 bbls. oil 3,280 ft.
Humble & Valley's No. 2 Sherrill ..... Drlg. shale and shell 2,825 ft.
Humble & Valley's No. 2 Beal ..... Drlg. hard sand 2,418 ft.
Humble & Valley's No. 3 Payne ..... Drlg. hard sand 1,511 ft.
Humble & Valley's No. 4 Urban ..... Drlg. sand and boulders 550 ft.
Humble & Valley's No. 4 Saunders ..... Rig.
Humble & Valley's No. 3 Mueller ..... Rig.
Humble & Valley's No. 4 Mueller ..... Location.
Humble & Valley's No. 5 Mueller ..... Location.
Humble & Valley's No. 2 Helmuth ..... Location.
Humble & Valley's No. 1 Diemer ..... Location.

DE WALT—FORT BEND COUNTY

Humble Oil & Refg. Co.'s No. 5 Nelson ..... Sandy shale showing oil; cemented casing 3,467 ft.
Humble Oil & Refg. Co.'s No. 5 Camp ..... Drlg. shale and sand 3,503 ft.
Humble Oil & Refg. Co.'s No. 7 Brazos ..... Preparing to resume drilling after blowout and fire, 3,000 ft.
Humble Oil & Refg. Co.'s No. 8 Brazos ..... Rig.
Humble Oil & Refg. Co.'s No. 9 Brazos ..... Drlg. sandy shale 1,743 ft.
Humble Oil & Refg. Co.'s No. 3 Hamner fee ..... Location.
Humble Oil & Refg. Co.'s No. 6 Hamner fee ..... Rig.
Humble Oil & Refg. Co.'s No. 7 Hamner fee ..... Comp. flowing 700 bbls. oil 3,600 ft.
Humble Oil & Refg. Co.'s No. 2-A Bankers Mortgage .... Drlg. hard sandy lime 2,469 ft.
Humble Oil & Refg. Co.'s No. 9 Sugarland ..... Drlg. sticky shale 3,481 ft.
Humble Oil & Refg. Co.'s No. 1 Hagenson ..... Rig.
Humble Oil & Refg. Co.'s No. 3 Deatherage ..... Derrick.

HUMBLE—HARRIS COUNTY

Continental Oil Co.'s No. 1 Wagner ..... Drlg. gumbo 834 ft.
Humble Oil & Refg. Co.'s No. 3 Williams ..... Drlg. sandy shale 4,143 ft.
Humble Oil & Refg. Co.'s No. 4 Williams ..... Rig.
Humble Oil & Refg. Co.'s No. 5 Williams ..... Derrick.
Humble Oil & Refg. Co.'s No. 1 Glass, south ..... Drlg. sticky shale 4,995 ft.
Marland Oil Co.'s No. 1 Cezeaux, south side ..... Standing 4,520 ft.
Navarro Oil Co.'s No. 1 La. Oil Refg. Corp. ..... Rig.
Harvey Smith et al's No. 1 Rosenthall, north side ..... Flowed for short time; oil sand 4,205 ft.
South Texas Petroleum Co.'s No. 7 Morris ..... Comp. flowing 600 bbls. 43.4 gravity oil 5,250 ft.
South Texas Petroleum Co.'s No. 9 Morris ..... Comp. flowing 1,800 bbls. pipe line oil 5,028 ft.
South Texas Petroleum Co.'s No. 10 Morris, south side.... Rig.
South Texas Petroleum Co.'s No. 11 Morris, south side.... Rig.
South Texas Petroleum Co.'s No. 1 Lee, south flank .... Rig.
Sun Oil Co.'s No. 47 River, north side ..... Drlg. shale 5,800 ft.
The Texas Company's No. 265 Landslide, south ..... Drlg. hard sticky shale.
The Texas Company's No. 266 Landslide ..... Drlg. lime, shale and sand 4,653 ft.
The Texas Company's No. 267 Landslide, south ..... Rig.
The Texas Company's No. 268 Landslide, south ..... Derrick
The Texas Company's No. 269 Landslide, south ..... Location.
The Texas Company's No. 35 Koehler ..... Comp. flowing 250 bbls. oil 4,339 ft.
The Texas Company's No. 23 House ..... Drlg. gumbo 744 ft.
West Production Co.'s No. 1 Foster ..... Location.

BLUE RIDGE—FORT BEND COUNTY

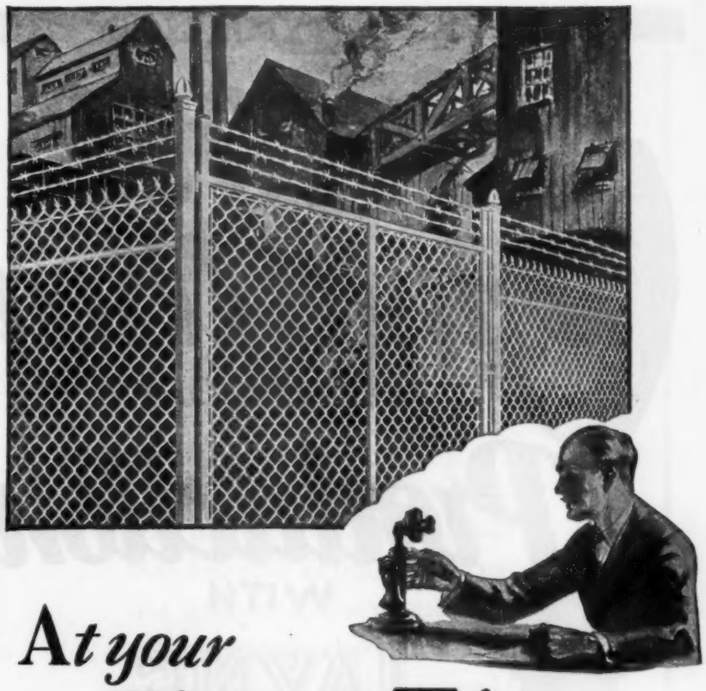
Cunningham Production Co.'s No. 2 Blakely (workover).. To deepen.
Gulf Production Co.'s No. 16 Luscher ..... Drlg. gumbo 3,601 ft.
Moody Corp.'s No. 8 West-Schenck ..... Set strainer to test 5,138 ft.
Sinclair Oil & Gas Co.'s No. 3 Davison (workover) ..... Pulling liner to deepen 4,632 ft.
South Texas Petroleum Co.'s No. 1 Lee (workover) ..... Drlg. 3,679 ft.

PIERCE JUNCTION—HARRIS COUNTY

Abercrombie & Harrison's No. 1 Ritter ..... Set casing to test oil sand 4,443 ft.
Anderson & Plummer's No. 5 Whitehead, old well ..... Comp. flowing 200 bbls. oil 3,541 ft.
Gulf Production Co.'s No. 23 Taylor (workover) ..... Rigging up to deepen.
Gulf Production Co.'s No. 29 Taylor (workover) ..... Coring oil sand 4,749 ft.
Gulf Production Co.'s No. 30 Taylor, east ..... Oil sand 3,949 ft.; cemented 6⅝-inch casing 3,905 ft.
Navarro Oil Co.-Humble Oil & Refg. Co.'s No. 4 Dooley, east ..... Abandoned; total depth 4,909 ft.; sidetracked and drilled to 2,710 ft.
Navarro Oil Co.'s No. 4-B Cain ..... Set screen 5,000 ft.; bailing.
Rio Bravo Oil Co.'s No. 11 B. Settegast ..... Drlg. gumbo and lime 2,564 ft.
Rio Bravo Oil Co.'s No. 7-A Settegast (workover) ..... Rigging up.
Rio Bravo Oil Co.'s No. 8-A Settegast (old well) ..... Pumping 150 bbls. oil 4,512 ft.
Rio Bravo Oil Co.'s No. 10-A Settegast (workover) ..... Comp. flowing 300 bbls. oil 4,301 ft.
Rio Bravo Oil Co.'s No. 14-A Settegast, west ..... Resumed drilling after shut-down 5,067 ft.
Saxet Gas Co.'s No. 2 Herman estate, southwest ..... Milling out to sidetrack.
Saxet Gas Co.'s No. 3 Herman estate, southwest ..... Flowing 200 bbls. fluid, 8 per cent b.s. and water, 3,778 ft.; to deepen.
Saxet Gas Co.'s No. 4 Herman (southwest) ..... Drlg. hard lime 1,445 ft.
Saxet Gas Co.'s No. 5 Herman (southwest) ..... Derrick.
J. F. Barron's No. 3 Fitzsimmons ..... Derrick.
Shaw & Texas Exploration Co.'s No. 2-F Fitzsimmons ... Derrick.
T. G. Shaw's No. 1 Dooley ..... Drlg. sand and shale showing oil 5,628 ft.
Superior Oil Corp.'s No. 5-B Settegast (workover) ..... To deepen.

LIBERTY—LIBERTY COUNTY

Empire Gas & Fuel Co.'s No. 3 Groggan ..... Oil sand 3,400 ft.; cement casing.
Empire Gas & Fuel Co.'s No. 4 Groggan ..... Drlg. 1,481 ft.
Empire Gas & Fuel Co.'s No. 5 Groggan ..... Drlg. 1,101 ft.
Navarro Oil Co.'s No. 2 Gulf ..... Drlg. 1,726 ft.
Navarro Oil Co.'s No. 5 Baldwin Community ..... Abandoned location.
Sun Oil Co.'s No. 47 Mitchell ..... Drlg. 3,086 ft.



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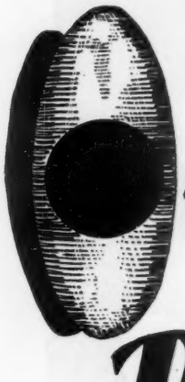

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Sun Oil Co.'s No. 48 Mitchell ..... Drlg. 602 ft.
Talley & O'Brien's No. 1 Deussen ..... Abandoned 1,734 ft.

HULL—LIBERTY COUNTY

Empire Gas & Fuel Co.'s No. 27 Barngrover, old well ... Drlg. 3,502 ft.
Gulf Production Co.'s No. 48 Phoenix (workover) ..... Drlg. 3,146 ft.
Houston Production Co.'s No. 13 Barngrover ... ... Rig.
Humble Oil & Refg. Co.'s No. 11 Hooks-Spell ..... Cementing 9⅝-in. casing 3,331 ft.
Republic Production Co.'s No. 35 Dolbear (workover).... Drlg. 4,143 ft.
Republic Production Co.'s No. 99 Dolbear (workover) ... To deepen.
Republic Production Co.'s No. 107 Dolbear (old well) .... No report.
Republic Production Co.'s No. 109 Dolbear (workover) ... To deepen.
Republic Production Co.'s No. 114 Dolbear (old well) ... Comp. flowing 300 bbls. fluid, 18 per cent water 2,497 ft.
Republic Production Co.'s No. 128 Dolbear (workover) ... Set strainer to test oil sand 2,581 ft.
The Texas Company's No. 1 Hannah-Vacuum (workover).. Pumping 150 bbls. fluid 300 per cent b.s. and water 2,976 ft.
The Texas Company's No. 8 Hannah-Vacuum ..... Location.

BIG CREEK—FORT BEND COUNTY

Gulf Production Co.'s No. 30 Davis (old well) ..... Pulling strainer to deepen 3,627 ft.
Gulf Production Co.'s No. 55 Davis ..... Drlg. 3,031 ft.
The Texas Company's No. 2 Wheat (old well) ..... Drlg. sticky shale 4,096 ft.
Navarro Oil Co.'s No. 4 Davis ..... Abandoned location.

NASH—BRAZORIA COUNTY

Rycade Oil Corp.'s No. 26 Wisdom ..... Drlg. hard sand rock 4,663 ft.

BATSON—HARDIN COUNTY

Acorn Oil Co.'s No. 71 Paraffine ..... Set strainer 1,143 ft.; to test oil sand.
W. G. Christian's No. 2 Millholme ..... Standing 1,721 ft.
Paraffine Oil Co.'s No. 46 Paraffine ..... Standing 1,243 ft.

SOUR LAKE—HARDIN COUNTY

Austin et al's No. 1 Watson ..... Location.
Humble Oil & Refg. Co.'s No. 6 Bashara (old well) .... Comp. pumping 200 bbls. fluid 40 per cent oil; 1,979 ft.
Lake View Oil Co.'s No. 62 Hardin ..... Drlg. 996 ft.
United Oil & Fuel Co.'s No. 1 Brown ..... Drlg. 1,422 ft.

SARATOGA—HARDIN COUNTY

Rio Bravo Oil Co.'s No. 79-A ..... Drlg. gumbo 250 ft.
Rio Bravo Oil Co.'s No. 79-C ..... Comp. pumping 20 bbls. oil 1,691 ft.
E. W. Skinner's No. 15 Kirby ..... Perforated casing 1,382 ft.; bailing.

ORANGE—ORANGE COUNTY

Brownie-Bobbett Oil Co.'s No. 6 McLean (workover) .... Pumping 10 bbls. net oil 3,568 ft.
Gulf Production Co.'s No. 1 Morse-Granger et al (workover) ..... Preparing to deepen.
Orange Petroleum Co.'s No. 8 Winfree (old well) ..... Washing 3,329 ft.
Rex Petroleum Co.'s No. 7 Carbello, old well ..... Sidetracking 2,864 ft.

GOOSE CREEK—HARRIS COUNTY

Cedar Bayou Oil Co.'s No. 11 Busch ..... Rig.
Russell Ferrell's No. 4 Gillette (workover) ..... Rigging.
Gulf Production Co.'s No. 25 Ashbel Smith (workover) ..... Oil sand 3,684 ft.; set strainer.
Humble Oil & Refg. Co.'s No. 75 Simms-Smith ..... Reaming; total depth 5,243 ft.
C. T. Rucker's No. 1 Jones ..... Shut down 1,586 ft.
Lake Shore Oil Co.'s No. 4 Duke ..... Drlg. 2,799 ft.
Lee & Scott's No. 3 Scott ..... Drlg. 1,762 ft.
Jim McMurry's No. 3 Grace Addey (old well) ..... Drlg. 2,955 ft.
Lube Well Oil Co.'s No. 1 Dannenbaum, old well ..... Tested salt water 1,607 ft.; shut down.
Newton & Lillie's No. 3 Schilling, old well ..... Drlg. 1,621 ft.

SPINDLETOP—JEFFERSON COUNTY

Sun Oil Co.'s No. 11 McLean (workover) ..... Comp. flowing 100 bbls. fluid, 1 per cent oil, 5,639 ft.
Yount Lee Oil Co.'s No. 62 McFaddin (workover) ..... Drlg. sand 4,941 ft.
Yount Lee Oil Co.'s No. 72 McFaddin (workover) ..... Drlg. sand 3,946 ft.
Yount Lee Oil Co.'s No. 109 McFaddin ..... Comp. flowing 300 bbls. oil 3,99[illegible] ft.
Yount Lee Oil Co.'s No. 110 McFaddin ..... Abandoned 4,030 ft.
Yount Lee Oil Co.'s No. 111 McFaddin ..... Drlg. sand and shale 4,027 ft.
Yount Lee Oil Co.'s No. 112 McFaddin ..... Drlg. shale 4,331 ft.
Yount Lee Oil Co.'s No. 113 McFaddin ..... Drlg. 4,072 ft.
Yount Lee Oil Co.'s No. 114 McFaddin ..... Rig.
Yount Lee Oil Co.'s No. 95 Gladys City, old well ..... Coring 3,987 ft.
Yount Lee Oil Co.'s No. 96 Gladys City ..... Rig.
Yount Lee Oil Co.'s No. 2 fee ..... Comp. flowing 400 bbls. oil 4,001 ft.

WEST COLUMBIA—BRAZORIA COUNTY

Gulf Production Co.'s No. 3-B Hogg ..... Location.
Humble Oil & Refg. Co.'s No. 3 Smith ..... Drlg. sticky shale 3,320 ft.
Marland Oil Co.'s No. 1 Hogg ..... Rig.
Saxet Oil Co.'s No. 1 Hogg ..... Drlg. rock 2,400 ft.
W. L. Pierson's No. 1 Masterson ..... Drlg. sand and gravel 660 ft.
The Texas Company's No. 24 Arnold ..... Cem. 6⅝-in. casing 2,836 ft.

HIGH ISLAND—GALVESTON COUNTY

Gulf Production Co.'s No. 4-A Smith ..... Drlg. 2,081 ft.
Marrs McLean's No. 6 Cade (old well) ..... To deepen.
Marrs McLean's No. 15 Cade ..... Drlg. 3,986 ft.
Marrs McLean's No. 16 Cade ..... Drlg. 1,242 ft.

DAMON MOUND—BRAZORIA COUNTY

Cullen & West's No. 1 Smith ..... Temporarily abandoned 4,543 ft.
Sinclair Oil & Gas Co.'s No. 6 Norton ..... Set screen 3,900 ft.; bailing.
Leonard Petroleum Co.'s No. 4 Wisdom ..... Drlg. sticky shale 3,398 ft.

ORCHARD—FORT BEND COUNTY

Gulf Prod. Co.'s No. 19 Moore ..... Drlg. hard sand and lime 4,341 ft.

NORTH DAYTON—LIBERTY COUNTY

Fort Bend Oil Co.'s No. 1 Ballarack ..... Shut down 4,650 ft.
Harrison Oil Co.'s No. 4 Quintette ..... Blew in gas well; sand 4,634-49 ft.

REFUGIO—REFUGIO COUNTY

George Ball's No. 1 Terrell (workover) ..... No report.
Morgan Oil Corp.'s No. 1 City ..... Total depth 3,679 ft.; oil sand 1, 666-75 ft.; cementing 6-inch casing 3,670 ft.
Morgan Oil Corp.'s No. 1 Fox heirs ..... Cem. 10-inch casing 495 ft.
Hewitt et al's No. 1 Cemetery ..... Derrick.
Houston Gulf Gas Co.'s No. 5 Ryals ..... Cem. 8¼-in. casing 3,668 ft.; oil sand 3,671-76 ft.
Houston Gulf Gas Co.'s No. 6 Shelly ..... Oil sand 5,060-70 ft.; cem. 5 3/16-in casing.
Houston Gulf Gas Co.'s No. 3 Rose Lambert ..... Waiting cement to set 3,648 ft.
Houston Gulf Gas Co.'s No. 5 O'Brien ..... Drlg. rock 1,138 ft.
Houston Gulf Gas Co.'s No. 2 Rooke ..... Cleaning hole 4,530 ft.; to deepen
Houston Gulf Gas Co.'s No. 4 Fannie Heard (workover).. Rigging up.
Houston Gulf Gas Co.'s No. 3 Fannie Heard ..... Rigging up.
Houston Gulf Gas Co.'s No. 1 Buckley ..... Fishing drill pipe 2,680 ft.
Houston Gulf Gas Co.'s No. 1 Morgan-Skelly ..... Drlg. sticky shale 3,037 ft.
Houston Gulf Gas Co.'s No. 1 Vance ..... Rig.
Korona Oil Co.'s No. 1 West ..... Cem. 10-in. casing 458 ft.
Korona Oil Co.'s No. 2 Reilly ..... Rig.
Mission Drlg. Co.'s No. 1 O'Brien ..... Drlg. sticky shale 5,025 ft.
Mission Drlg. Co.'s No. 2 Powers ..... Drlg. rock 4,300 ft.
Mission Drlg. Co.'s No. 1 J. F. B. Heard ..... Total depth 4,630 ft.; plugged to 3,630 ft.; drlg. 8¼-in. plug.
Mission Drlg. Co.'s No. 2 J. F. B. Heard ..... Drlg. sticky shale 1,607 ft.
Mission Drlg. Co.'s No. 2 Skelly ..... Derrick.
Mission Drlg. Co.'s No. 1 Strauch ..... Drlg. sticky shale 1,107 ft.
Mission Drlg. Co.'s No. 1 Fox (workover) ..... Deepened from 3,675 to 3,6[illegible] ft.; reset screen; trying to hold gas pressure.
Mission Drlg. Co.'s No. 2 Mitchell ..... Rig.
Benedum & Trees' No. 4 Clint Heard ..... Putting on gas at 3,695 ft.
Cigufer Oil Co.'s No. 3 Ryals ..... Derrick.
Saxet Oil Co.'s No. 1 Serafine ..... Rig.
Saxet Oil Co.'s No. 1 City ..... Rig.
Saxet Co.'s No. 5 Clint Heard ..... Tested salt water 3,682 ft.; abandoned.
Saxet Co.'s No. 9 Claude Heard ..... Drlg. hard sandy lime 3,475 ft.
Houston Oil Co.'s No. 2 Rea ..... Gas sand 3,590-98 ft.

Houston Oil Co.'s No. 6 Wilson Heard ..... Swabbed salt water 3,692 ft.; to sidetrack.
Houston Oil Co.'s No. 8 Wilson Heard ..... Cem. 12-inch casing 520 ft.
Houston Oil Co.'s No. 6 Fannie Heard (workover) ..... Cutting casing 3,305 ft.
Blanco Creek Oil Co.'s No. 1 St. Johns ..... Shut down 3,700 ft.
W. L. Pearson, trustee, No. 2 Fox ..... Derrick.
W. L. Pearson, trustee, No. 1 Simpson ..... Drlg. gumbo 1,910 ft.
Sun Oil Co.'s No. 2 Buckley ..... Shut down for repairs 846 ft.
Sun Oil Co.'s No. 1 Lietiring ..... Derrick.
Sun Oil Co.'s No. 1 Johnson ..... Rig.
Texas Gas Co.'s No. 1 Rogers ..... Total depth 3,678 ft.; cem. 6-in. casing 3,677 ft.
Union Exploration Co.'s No. 2 Rooke ..... Drlg. shale 3,134 ft.

SOUTH LOUISIANA FIELDS

LOCKPORT—CALCASIEU PARISH

Shell Petroleum Corp.'s No. 1 Miller ..... Flowed salt water 6,692 ft.
Vacuum & Gulf's No. 15 Milier ..... Drlg. hard rock 4,068 ft.
Vacuum & Gulf's No. 3 State ..... Drlg. gumbo 4,901 ft.
Vacuum Oil Co.'s No. 7 Bordages ..... Drlg. oil sand; set 9⅝-in. casing 3,688 ft.
Vacuum Oil Co.'s No. 3-A fee ..... Drlg. hard sand 3,501 ft.

HACKBERRY—CAMERON PARISH

Calcasieu Oil Co.'s No. 7 Dorion, East Hackberry ..... Location.
Calcasieu Oil Co.'s No. 15 Watkins, East Hackberry ..... Drlg. gumbo 3,756 ft.
Praim Oil Co.'s No. 1 Duhon, Old Hackberry ..... Standing 4,384 ft.
Rycade Oil Corp.-Humble Oil & Refg. Co.'s No. 3 Gulf Land, Old Hackberry ..... Oil sand 3,850-82 ft.; drilling plug
Sunshine Oil Co.'s No. 2 Ellender, Old Hackberry ..... Location.
Sunshine Oil Co.'s No. 3 Ellender, Old Hackberry ..... Location.
The Texas Company's No. 5-B Calcasieu Lake, East Hackberry ..... Fishing 3,855 ft.
Yount Lee Oil Co.'s No. 9 School Land (Old Hackberry) .. Drlg. shale and lime 4,741 ft.

JENNINGS—ACADIA PARISH

Fred Getty's No. 3 Jennings-Clemont ..... Location.
Kathleen Oil Co.'s No. 1 Syndicate fee ..... Drlg. gumbo 3,870 ft.
E. L. Meyers' No. 1 Clemont-Zigler (old well) ..... To work over 1,805 ft.
The Texas Company's No. 5 Rayne heirs (King tract) ... No report.
Yount Lee Oil Co.'s No. 4 Crowley, northeast flank, Section 48-9s-2w ..... Waiting drill stem; cement setting 7,546 ft.
Yount Lee Oil Co.'s No. 5 Crowley, Sec. 48-9s-2w ..... Location.
Yount Lee Oil Co.'s No. 1 Houssiere-Latrielle, Sec. 47-9s-2w ..... No report.

EDGERLY—CALCASIEU PARISH

C. M. Crotty's No. 15 Lillard ..... Set casing to test oil sand 1,896 ft.

VINTON—CALCASIEU PARISH

Gulf Refining Co.'s No. 48 Star Vincent, Sec. 34-10s-12w .. Drlg. 1,982 ft.
Salt Dome Oil Co.'s No. 2 Shaw ..... Pumping 10 bbls. 2,859 ft.
Vinton Petroleum Co.'s No. 9 Rescue (9 acres) ..... Comp. flowing 400 bbls. oil 3,147 ft.

BAYOU BOUILLON—ST. MARTIN PARISH

Rycade Oil Corp.'s No. 7 Bouillon fee ..... Drlg. hard sandy shale 4,254 ft.
Rycade Oil Corp.'s No. 3 State (former well) ..... Milling 3,583 ft.

SORRENTO—ASCENSION PARISH

Gulf Refining Co.'s No. 15 United, Sec. 22-10S-4e ..... Drlg. 4,641 ft.

STARKS—CALCASIEU PARISH

Gulf Refining Co.'s No. 13 Industrial ..... Abandoned 7,207 ft.

SULPHUR—CALCASIEU PARISH

Union Sulphur Co.'s No. 736 fee ..... Fishing drill pipe 6,064 ft.
Union Sulphur Co.'s No. 746 fee, Sec. 29-9s-10w ..... No report.
Union Sulphur Co.'s No. 749 fee, Sec. 29-9s-10w ..... No report.

SWEET LAKE—CAMERON PARISH

Pure Oil Co.'s No. 7 Yount Lee ..... Drlg. sand and hard shale 6,255 ft.
Pure Oil Co.'s No. 8 Yount Lee ..... Shut down.

ANSE LA BUTTE—ST. MARTIN PARISH

Yount Lee Oil Co.'s No. 5 Louisiana Pet. Co. ..... Rigging up to pump.

MISCELLANEOUS WILDCATS

TEXAS

AUSTIN COUNTY

Whittington et al's No. 1 Lass, 4 miles northwest of Bellville ..... No report.

CHAMBERS COUNTY

Chicago Oil Corp.'s No. 1 Lawrence ..... Shut down in gumbo 1,200 ft.
Layne et al's No. 1 Fitzgerald ..... Shut down in rock 2,635 ft.
Pure Oil Co.'s No. 3 Mayes, Lost Lake ..... Drlg. sandy shale 2,770 ft.
Pure Oil Co.'s No. 3 Lost Lake, Lost Lake ..... Rig.

FORT BEND COUNTY

Gulf Production Co.'s No. 12 Trone, Long Point ..... Drlg. hard sand 4,257 ft.
Grayburg Oil Co.'s No. 1 Ranson ..... Drlg. sand and lime 3,474 ft.
Humble Oil & Refg. Co.'s No. 1 Miller, Rosenberg ..... Abandoned 5,371 ft.

HARRIS COUNTY

Baldwin and associates' No. 1 Kitzman, Cypress ..... Standing 4,055 ft.
Gulf Crest Oil Co.'s No. 1 Gulf Crest ..... Derrick.
A. F. Belunek's No. 1 Thompson ..... Started drilling.
Humble Oil & Refg. Co.'s No. 6 Warren Hockley ..... Drlg. sand 2,075 ft.
Humble Oil & Refg. Co.'s No. 2 Irvin ..... Set 2 joints screen 4,189 ft.; completed est'mated 50,000,000 ft. dry gas, 1,550 pounds.
Humble Oil & Refg. Co.'s No. 1 Woodburn, Genoa ..... Drlg. sand 4,667 ft.
Paxton et al's No. 1 Brown, Wooster ..... Standing.
York & Robertson's No. 1 Garrett, Harris & Carpenter Sur. ..... No report.

JEFFERSON COUNTY

Bleakie Oil Co.'s No. 1 Tolliver, Dyches Sur. ..... Shut down 2,800 ft.
Deep Test Oil Corp.'s No. 1 Faith-McFadden ..... Shut down 3,706 ft.
Gulf Production Co.'s No. 3 Burrell Fannette ..... Sidetracking 2,680 ft.
Gulf Production Co.'s No. 1 Junker, Fannette ..... Drlg. gumbo 1,400 ft.
Gulf Production Co.'s No. 11 Thomas, Fannette (workover) ..... Rigging up to pump 5,636 ft.
River Oil Corp.'s No. 1 Ship Channel, Brown Survey .... Drlg. 2,700 ft.
Shell Petroleum Corp.'s No. 1 Heisig, Hampshire ..... Drlg. gummy shale and lime 6,508 ft.
The Texas Company's No. 2 Pipkin, Big Hill ..... Drlg. hard sand 2,464 ft.
The Texas Company's No. 1 Fitzhugh, Big Hill ..... Location.
The Texas Company's No. 1 Burrell, Fannette ..... Rig.
Vacuum Oil Co.'s No. 1 Herbert-Broussard, T.&N.O. Sur. No. 208 ..... Drlg. sandy shale 2,791 ft.
Westbury Oil Co.'s No. 1 West ..... Shut down 2,325 ft.

LIBERTY COUNTY

Gulf Production Co.'s No. 2 Boyt Hankamer ..... Tested salt water 3,550 ft.; to deepen.
Humble Oil & Refg. Co.'s No. 6 Sterling, Moss Bluff .... Rig.
Pure Oil Co.'s No. 1 Liberty, Moss Bluff ..... Drlg. gumbo, sticky shale and lime rock 4,182 ft.
Union Exploration Co.'s No. 3 Esperson, Sheeks ..... Set 1 joint 6⅝-in. screen 1,834 ft.; flowing 2 bbls. oil hourly.
Union Exploration Co.'s No. 1 Vajdak, Sheeks ..... Derrick.
Union Exploration Co.'s No. 4 Esperson, Sheeks ..... Derrick.

MATAGORDA COUNTY

Crossland and associates' No. 1 Hawkins, Shepherds Mott.. Abandoned 4,850 ft.

MONTGOMERY COUNTY

Kelley-Baker et al's No. 1 Juerges ..... No report.

ORANGE COUNTY

Gulf Production Co.'s No. 1 Starks, Port Neches ..... Rig.
The Texas Company's No. 1 Polk, Port Neches ..... Derrick.
The Texas Company's No. 1 Starks, Port Neches ..... Drlg. sand 1,958 ft.

WALLER COUNTY

Kirby Petroleum Co.'s No. 1 Vaughn, San Felipe ..... Building new derrick; bottom of hole 3,005 ft.

SOUTH LOUISIANA

ASCENSION PARISH

Pickard & Geisman's No. 1 Desire Breaux, Darrow ..... Shut down 3,778 ft.
Big Dome Drlg. & Dev. Co.'s No. 1 Reardon, Darrow ... Total depth 4,747 ft.; standing with casing collapsed.
Triumph Oil Corp.'s No. 2 Lacey, Sec. 20-10s-4e ..... No report.

CALCASIEU PARISH

Wilfred LaHay's No. 2 James, Sec. 14-10s-13w ..... Shut down 3,365 ft.

Lummus Refinery Construction

Showing two complete pipe still units each handling 10,000 barrels crude, separating gasolene, kerosene, gas oil, pressable distillate, cylinder stock and asphalt residuum.

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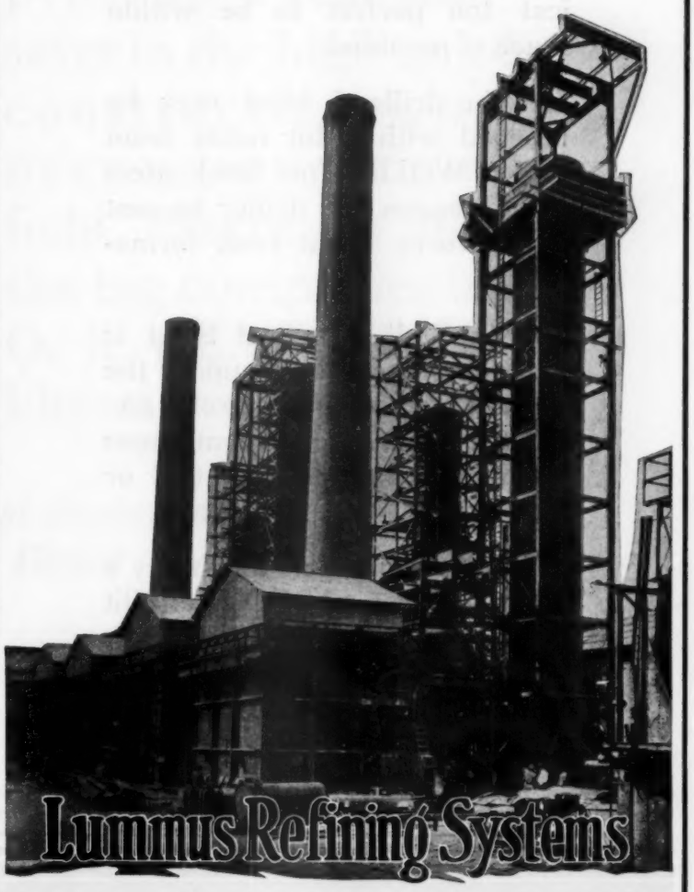

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THE ANDREWS STEEL CO.
NEWPORT KENTUCKY

J. O. Davis' No. 1 Mims, Sec. 20-9s-7w ..... Standing 5,600 ft.

CAMERON PARISH

Shell Pet. Corp.'s No. 11 Watkins, Black Bayou ..... Mixing mud 1,555 ft.
Shell Pet. Co.'s No. 12 Watkins, Black Bayou ..... Drlg. sticky shale and lime 3,441 ft.
Shell Pet. Corp.'s No. 13 Watkins, Black Bayou ..... Location.
Shell Pet. Corp.'s No. 1 Marceaux, Mallard Bay, Sec. 32-12s-3w ..... Building derrick.
The Texas Company's No. 4-A Calcasieu Lake, Calcasieu Lake Dome ..... Building derrick.
Yount Lee Oil Co.'s No. 1 Starks, Sec. 1-15s-15w ..... Location.

EVANGELINE PARISH

The Texas Company's No. 1 Guillory, Pine Prairie ..... No report.

IBERIA PARISH

Jefferson Lake Oil Co.'s No. 2 Lake Peigneur, Jefferson Island ..... Rig.
The Texas Company's No. 4-A Vermillion Bay ..... Building derrick.
Gulf Refg. Co.'s No. 10-Z State, Loreauville ..... Abandoned 1,600 ft.

IBERVILLE PARISH

Shell Petroleum Corp.'s No. 3 Wilbert, White Castle ..... Shut down 6,017 ft.
Standard Oil Co.'s No. 3 Wilbert, Bayou Blue ..... No report.
Standard Oil Co.'s No. 2 Schwing, Bayou Blue ..... No report.
Standard Oil Co.'s No. 3 Schwing, Bayou Blue ..... Location.
Standard Oil Co.'s No. 4 Schwing, Bayou Blue ..... Location.
Standard Oil Co.'s No. 5 Schwing, Bayou Blue ..... Derrick.

JEFFERSON DAVIS PARISH

Vacuum Oil Co.'s No. 2 DeVilbiss, Roanoke ..... Drlg. gumbo 4,006 ft.

PLAQUEMINE PARISH

The Texas Company's No. 2 Garden Island Bay, Sec. 107-23s-32e ..... Cleaning up after blowout.
Humble Oil & Refg. Co.'s No. 1 State, Sec. 2-20s-26e ..... Rig.
Humble Oil & Refg. Co.'s No. 1 Lake Washington, Twp. 20s-26e ..... Location.

ST. BERNARD PARISH

St. Bernard Oil & Gas Co.'s No. 1 fee, Sec. 15-14s-15e ... Shut down 726 ft.

ST. MARTIN PARISH

Ohio Oil Co.'s No. 3 Martin, Hager Dome ..... Standing 4,490 ft.
The Texas Company's No. 1 fee, Hager Dome ..... Drlg. shale 3,945 ft.
The Texas Company's No. 2 St. Martin, Hager ..... Rig standing.

ST. TAMMANY PARISH

St. Tammany Oil Co.'s No. 2 Fritchie, Sec. 35-8s-14e .... Drlg. 2,306 ft.

TANGIPAHOA PARISH

Completion Oil Co.'s No. 1 Amos ..... No report.
Joan Development Co.'s No. 1 Hilton, Sec. 20-9s-9e ..... Shut down 3,985 ft.

TERREBONNE PARISH

The Texas Company's No. 2-A Dog Lake Bayou, 400 ft. south of No. 1 ..... Derrick.
The Texas Company's No. 1-B Dog Lake, Sec. 6-22s-16e.. Set 9¼-in. casing in gumbo 711 ft.
The Texas Company's No. 1 Taylor, East Bay Junop Dome ..... Set 20-in. surface casing in sticky shale 140 ft.
The Texas Company's No. 2-A Lake Barre, Section 30-21e-20e ..... Drlg. sticky shale 1,850 ft.
The Texas Company's No. 2-B Bay Coon Road, Sec. 17-22s-18e ..... Set 12½-in. casing 611 ft.
The Texas Company's No. 3-B Bay Coon Road, Sec. 17-22e-18e ..... Location.
The Texas Company's No. 2 La. L. L. & E. Co., Four Isle.. Building foundations.

WILDCAT OPERATIONS IN TEXAS PANHANDLE

(Continued from Page 62)

DONLEY COUNTY

Blue Bonnett Oil Co.'s No. 1 Ball, 1,075 ft. from N line, 985 ft. from E line, Sec. 22, Blk. E, D.&P.R.R. Sur. .. Drlg. 2,300 ft.
Marine Oil Co.'s No. 1 Sawyer, C SW, Sec. 5, Blk G. G.C.&S.F. Sur. ..... S.D. 3,510 ft.
Southland Oil Co.'s No. 1 Lewis, C SE 40 ac., Sec. 3, Blk. 29, H.&G.N.R.R. Sur. ..... Drlg. 455 ft; 15½-in. csg. set at 315 ft.

GRAY COUNTY

British-American Oil Co.'s No. 2 Purviance, 330 ft. N and E SW cor. E 160 ac., Sec. 61, Blk. B-2, H.&G. N.R.R. Sur. ..... Location.
Champlin Ref. and Danciger's No. 2 Cook-Faulkner, 360 ft. N and 330 ft. E, SW cor. W 120 ac. of E 200 ac., Sec. 30, Blk. B-2, H.&G.N.R.R. Sur. ..... Fishing 2,845 ft; S.O. 2,840 ft.
Champlin Ref. Co.'s No. 3 Jackson, 330 ft. each way from SE cor., W 100 ac., Sec. 60, Blk. B-2, H.&G.N... Sprayed 5 bbls; T.P. 2,920 ft; T.D.3,520 ft; U.R. 6⅝-in. csg. 3,480 ft.
Champlin Ref. Co.'s No. 3 McLaughlin, 990 ft. from S and E lines E½, Sec. 33, Blk. B-2 ..... Location.
Crabtree Drlg. Co.'s No. 1 B. F. Talley, SW NE, Sec. 114, Blk. M-2, B.S.&F. Sur. ..... S.D. 2,740 ft.
Danciger O. & R. Co.'s No. 2 Beck, 330 ft. N and E SW cor. NW, Sec. 28, Blk. B-2, H.&G.N. Sur. ..... T.D. 2,845 ft; 2,600 ft. oil in hole 2,842-45 ft; 3,000,000 ft. gas
Danciger O. & R. Co.'s No. 1 Block, 330 ft. from S and W of SE, Sec. 149, Blk. 3, I.&G.N. Sur. ..... Location.
Danciger O. & R. Co.'s No. 3 Beck, 330 ft. S and 990 ft. E NW, Sec. 28, Blk. B-2, H.&G.N.R.R. Sur. ..... T.D. 2,790 ft; set 8⅛-in. csg.
Danciger O. & R. Co.'s No. 4 Beck, 330 ft. S and W, NE cor., Sec. 28, Blk. B-2, H.&G.N. Sur. ..... Drlg. 1,628 ft.
Danciger O. & R. Co.'s No. 5 Beck, 330 ft. S and E, NW cor. SW, Sec. 28, Blk. B-2, H.&G.N. Sur. ..... Drlg. 2,100 ft.
Danciger et als' No. 11 Jackson, 330 ft. S and 1,320 ft. W, NE cor. NW, Sec. 33, Blk. B-2, H.&G.N. Sur. .... T.D. 2,906 ft; set 8¼-in. csg.
Danciger O. & R. Co.'s No. 1 McLarty, 1,220 ft. from S. 330 ft. from W, W½ NW, Sec. 10, Blk. 1, A.C.H. &B. Sur. ..... Location.
Danciger O. & R. Co.'s No. 1 Williams, 330 ft. from N, 330 ft. from E, S½ NW ..... S.D. 2,670 ft; estimated 15,000,000 ft. gas 2,610-70 ft.
Delaney & Associates Oil Co.'s No. 8 Jackson, 990 ft. S and 330 ft. E NW cor. E½ SW, Sec. 38, Blk. B-2, H.&G.N.R.R. Sur. ..... Drlg. 2,632 ft; 4,000,000 ft. gas 1 470-90 ft. and 2,530 ft.
Dye & Gillette's No. 2 J. L. Noel, 330 ft. N and E, SW cor. NE, Sec. 187, Blk. 3, I.&G.N. Sur. ..... Drlg. 2,125 ft.
Bob Dunlap's No. 2 Morse, 990 ft. from N. 330 ft. from W, Sec. 2, Blk. 26 ..... Fishing 2,575 ft; swbd. 100 bbls in 24 hrs; T.P. 2,476 ft.
Empire G. & F. Co.'s No. 1 Noel, C SE, Sec. 151, Blk. 3, I.&G.N.R.R. Sur. ..... Drlg. 3,327 ft; S.O. 3,145-50 ft.
Sines Q Reiger's, formerly Eslick et als' No. 1 Mrs. J. A. Hopkins, NW cor. W 80 ac. of SW, Sec. 84, Blk. B-2, H.&T.C. Sur. ..... S.D. 3,206 ft.
Gardner Bros. and Collins' No. 2 Saunders, 955 ft. from S and 330 ft. from E of W 68 ac. E½, J. G. Eustice Sur. ..... Location.
Gulf Prod. Co.'s No. 2 Saunders, 990 ft. N and E, SW cor. Sec. 3, Blk. 1, A.C.H.&B.R.R. Sur. ..... S.D. 2,616 ft; shot 170 qts. 2,540-2,596 ft; C.O.
Gulf Prod. Co.'s No. 2 Worley-A, 330 ft. N, 990 ft. W, SE SW, Sec. 36, Blk. 3, I.&G.N. Sur. ..... Drlg. 1,460 ft.
Gulf Prod. Co.'s No. 3 Worley-A, 330 ft. N, 1,650 ft. W, SE SW, Sec. 36, Blk. 3, I.&G.N.R.R. Sur. ..... Drlg. 620 ft.
Guernsey Oil Co.'s No. 1 Pope, 330 ft. from N and W lines, W½ SW, Sec. 173, Blk. 3, I.&G.N. Sur. ..... Drlg. 430 ft.
Herragan Oil Co.'s No. 1 Bradford, 330 ft. from N and 990 ft. from E. Sec. 123, Blk. B-2 ..... S.D. 400 ft.
Humble O. & R. Co.'s No. 3 Jackson, 230 ft. from E line, 330 ft. from N line of E 110.5 ac., Sec. 90, Blk. B-2, H.&G.N.R.R. Sur. ..... Rigging up.

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Humble O. & R. Co.'s No. 1 Palmer, 330 ft. from N and E lines, of W 100 ac., Sec. 31, Blk. B-2, H.&G. N. Sur. ..... Drlg. 1,875 ft.

Independent O. & G. Co.'s No. 1 Hollenbeck, 990 ft. each way from NE cor. NE, Sec. 176, Blk. 3, I.& G.N.R.R. Sur. ..... 5,000,000 ft. gas from 2,428-83 ft.. T.D. 3,315 ft.

Lyon et als' No. 1 Morse, 330 ft. N and E SW cor. N½ NE, Sec. 2, Blk. 26, H.&G.N.R.R. Sur. ..... S.D. 2,638 ft; swbd. 100 bbls. 2,-574-99 ft. and 2,635-38 ft; C.O.

Magnolia Pet. Co.'s No. 1 Wright, 330 ft. S and W lines S½ SW, Sec. 13, Blk. 3, I.&G.N. Sur. .....

McLain Oil Co.'s No. 1 Back, 1,000 ft. from W line and 330 ft from N line, NW, Sec. 24, Blk. 25, H.&G.N. Sur. ..... 1,000,000 ft. gas 2,105-10 ft. and estimated 3,000,000 ft. gas 2,202-08 ft; show oil 2,565-90 ft. and 2,714 ft; shot 100 qts. 2,565-2,-839 ft; spraying 6 bbls. oil per day; S.D. 2,846 ft; C.O.

McMan O. & G. Co.'s No. 3 Palmer, 799 ft. N and 330 ft. W. SE cor. E 100 ac. of W 200 ac., Sec. 31, Blk. B-2, H.&G.N. Sur. ..... T.D. 2,895 ft; swbng. 50 bbls. per hr. 2,870-95 ft.

McMan O. & G. Co.'s No. 4 Palmer, 899 ft. S and 330 ft. W, NE cor. of E 100 ac. of W 200 ac., Sec. 31, Blk. B-2, H.&G.N. Sur. ..... Drlg. 2,075 ft.

McMan O. & G. Co.'s No. 5 Palmer, 330 ft. S, 930 ft. W, NE cor., E 100 ac. of W 200 ac., Sec. 31, Blk. B-2, H.&G.N. Sur. ..... Drlg. 2,100 ft.

McMan O. & G. Co.'s No. 6 Palmer, 330 ft. S and E of NW E 100 ac. of W 200 ac., Sec. 31, Blk. B-2, H.&G.N. Sur. ..... Drlg. 1,220 ft.

McMan O. & G. Co.'s No. 3 Saunders, 1,650 ft. N, 330 ft. E, SW cor., E 80 ac. of W 148 ac. of E 296 ac. of J. G. Eustis Sur. ..... Drlg. 1,780 ft.

Midwest Explin. Co.'s No. 2-B Bowers, 1,320 ft. from N. 330 ft. from E, Sec. 93, Blk. B-2, H.&G.N.R.R. Sur. ..... Location.

Mordyan O. & G. Co.'s No. 2 Davis, 330 ft. from N, 990 ft. from E, S½ NW, Sec. 8, Blk. 1 ..... Drlg. 1,910 ft.

Oil Operators' No. 1 Bowers, 330 ft. from N, 330 ft E, Sec. 93, Blk. B-2, H.&G.N. Sur. ..... Show oil and gas 2,400-17 ft; drlg. 2,794 ft; first gas 2,483 ft; increased at 2,500 ft., 2,544 ft. and 2,590 ft.

Operators Oil Co.'s No. 1 Lovett, 330 ft. from N and W line, W½ NE, Sec. 57, Blk. B-2, H.&G.N. Sur. ... Drlg. 1,970 ft.

Operators Oil Co.'s No. 5 Cook-Faulkner, 990 ft. N and 330 ft. W, SE of W 90 ac., Sec. 30, Blk. B-2, H.&G. N. Sur. ..... S.D. 2,748 ft.

Operators Oil Co.'s No. 6 Cook-Faulkner, 330 ft. S and E, NW cor., Sec. 30, Blk. B-2, H.&G.N.R.R. Sur. .... Show gas 2,424 and 2,477 ft; S.D. 2,750 ft.

Osborn et als' No. 1 Morse, 330 ft. N and E, SW cor. S½ NE. Sec. 1. Blk. 26, H.&G.N.R.R. Sur. ..... Drlg. 1,350 ft.

Panhandle Ref. Co.'s No. 3 Saunders, 330 ft. N and E, SW cor. E½ NE. Sec. 3, Blk. 1, A.C.H.&B. Sur. .... Rigging up.

Phillips Pet Co.'s No. 1 Eakin, 330 ft. from S. 330 ft. from W, Sec. 56, Blk. 25, H.&G.N.R.R. Sur. ..... Show gas 2,245-55 ft; fishing 2,-490 ft; 1,000,000 ft. gas 2,1770-2,255 ft.

Phillips Pet. Co.'s No. 1 Jackson, 330 ft. each way from NE cor. NE, Sec. 58, Blk. B-2, H.&G.N.R.R. Sur. .. Show oil 2,712-32 ft; 250 ft oil in hole; set 5-in. csg. 3,018 ft; 7,000,000 ft. gas 3,130 ft; 1,000,-000 ft. gas 3,144 ft; T.D. 3,-210 ft.

Phillips Pet. Co.'s No. 2-A Jackson, 425 ft. S and E, NW NE. Sec. 88, Blk. B-2, H.&G.N.R.R. Sur. ..... S.D. 2,790 ft.

Phillips Pet. Co.'s No. 6 Jackson, 330 ft. from N, 990 ft. from E line, S½ NE, Sec. 84 Blk. B-2, H.&G. N.R.R. Sur. ..... Rig.

Phillips Pet. Co.'s No. 6 Palmer, 330 ft. S and W, NE cor., Sec. 31, Blk. 2, H.&G.N.R.R. Sur. ..... Drlg. 1,510 ft.

Phillips Pet. Co.'s No. 7 Palmer, 990 ft. N and 330 ft. E, SW cor. E 183.1 ac. of Sec. 31, Blk. B-2, H.&G. N. Sur. ..... Drlg. 2,680 ft.

Phillips Pet. Co.'s No. 8 Palmer, 1,650 ft. N and 330 ft. E of SW cor. E 83.1 ac., Sec. 31, Blk. B-2, H.&G. N.R.R. Sur. ..... S.D. 2,764 ft.

Prairie O. & G. Co.'s No. 1 Langham, 330 ft. N and E SW, Sec. 1, Blk. B-2, H.&G.N.R.R. Sur. ..... Drlg. 2,650 ft.

Quillian et als' No. 1 Barrett, 330 ft. from N, 330 ft. from E, Sec. 131, Blk. 3, H.&G.N. Sur. ..... S.D. 525 ft.

Shamrock Oil Co.'s No. 1 Clayton. 150 ft. from NE cor. of S 80 ac. of W 140 ac. of E 277 ac., Sec. 50, Blk. 25, H.&G.N. Sur. ..... S.D. 2,750 ft.

Sherwood et als' No. 1 Gething, 330 ft. N and W SE cor N½ NE, Sec. 14, Blk. A-9, H.&G.N. Sur. ..... S.D. 2,183 ft.

St. Clair Oil Co.'s No. 1 Dial, 330 ft. S and W NE cor. SE. Sec. 10, Blk. 25, H.&G.N.R.R. Sur. ..... Cellar.

St. Clair Oil Co.'s No. 1 Rowe, Sec. 32, Blk. R ..... S.D. 3,490 ft. hole full water.

St. Clair Oil Co.'s No. 1 L. S. Stockton, SE cor. Sec. 35, W. R. Lee Sur. ..... Spudded and S.D.

The Texas Corp.'s No. 12 Bowers, 330 ft. from N and 330 ft. from W of NE, Sec. 63, Blk. B-2 ..... Drlg. 3,065 ft.

The Texas Corp.'s No. 3 Bruce Bull, 330 ft. from N, 330 ft. from W. Sec. 3, Blk B-2 ..... 8,000,000 ft. gas 2,340-50 ft; drlg. 2,675 ft.

The Texas Co.'s No. 3-B Chapman, 330 ft. S and E, NW cor. SE. Sec. 69, Blk. 25, H.&G.N.R.R. Sur. ..... Location.

The Texas Co.'s No. 2 Comb-Worley, 330 ft. N and 2,310 ft. W SE cor. S½ S line, Sec. 36, Blk. 3, I.&G.N. Sur. . 5,000,000 ft. gas 2,835-50 ft. and 70,000,000 ft. gas 2,884 ft; drlg. 2,918 ft; flowing 350 bbls. per day; top pay 2,915 ft.

The Texas Co.'s No. 3 Comb-Worley, 330 ft. N and W SE cor. Sec. 36, Blk. 3, I.&G.N. Sur. ..... Drlg. 2,675 ft.

The Texas Co.'s No. 4 Comb-Worley, 330 ft. N and 1,736 ft. W SE cor. Sec. 36, Blk. 3, I.&G.N. Sur. .... T.D. 2,780 ft; set 8¼-in. csg.

The Texas Corp.'s No. 4 Cook-Faulkner, 1,973 ft. from W line and 330 ft. from N line of W 160 ac., Sec. 29, Blk. B-2, H.&G.N. Sur. ..... Fish. 2,835 ft.

The Texas Co.'s No. 3 Shaw, 330 ft. N and E of SW of E 279 ac., Sec. 5, Blk. 1, A.C.H.&B. Sur. ..... Drlg. 2,375 ft.

The Texas Co.'s No. 6 Williams, 330 ft. S and E, NW cor. NE. Sec. 6, Blk. 1, A.C.H.&B. Sur. ..... T.D. 1,900 ft.; set 8¼-in. csg.

White Eagle O. & R. Co.'s No. 1 Faulkner, 330 ft. each way from SE cor. of E 60 ac., Sec. 29, Blk. B-2. H.&GN Sur ..... S.D. 2,717 ft; set 8¼-in. csg.

P. A. Thorpe's No 1 Finley, 3,416 ft. from S and 330 ft. from W of B. F. Chaney Sur. ..... Drlg. 2,010 ft.

Wilcox-Pampa Oil Co.'s No. 9 Combs-Worley, 330 ft. S and E, NW cor. NE SW, Sec. 35, Blk. 3, I.&G.N.R. R. Sur. ..... T.D. 2,630 ft; estimated 15,000,000 ft. gas 2,575-2,625 ft.

White Eagle O. & R. Co. et als' No. 2 Faulkner, 330 ft. from S and W of E 60 ac., Sec. 29, Blk. B-2 ..... Location.

HOCKLEY COUNTY

World Oil Co.'s No. 1 Ellwood, 320 ft. from N and W lines, League 7, Wilbarger County School lands; elevation 3,363 ft; contract depth 5,000 ft. ..... S.D. 3,224 ft.

HUTCHINSON COUNTY

Amarillo Oil Co.'s No. 2 Ingerton-A, 1,650 ft. from N line, 1,071 ft. from E line, Sec. 41, H.&T.C.R.R. Sur 50,000,000 ft. gas 1,300 ft; gas 3,-990 ft; T.D. 4,145 ft; P.B. 3,835 ft; shot 190 q.s. 3,785-3,835 ft; C.O.; to shoot 3,136-54 ft.

Alamosa Oil Co.'s No. 4 Sanford, 310 ft. S and 320 ft. W, NE cor. of N 160 ac. of S 240 ac., Sec. 85, Blk. 46, H.&T.C. Sur. ..... Drlg. 2,010 ft.

Continental Oil Co.'s No. 1-B Johnson, 330 ft. S and W, NE cor. NW, Sec. 6, Blk. 1, B.&B. Sur. ..... Drlg. 1,100 ft.

Devore Oil Co.'s No. 1 Johnson Bros., 330 ft. from S and E line, NW SW, Sec. 28, Blk. Y, A.&B. Sur. ..... Drlg. 1,250 ft.

Holmes et als' No. 2 Quinn, 990 ft. from S line and 330 ft. from E line SW, Sec. 7, Blk. 9, I.&G.N. Sur. ..... T.D. 3,292 ft; shot 300 qts. 3,021-75 ft.

Holmes et als' No. 2 Moore, 990 ft. N and 330 ft. E, SW cor. E½ SE, Sec. 125, Blk. 4, I.&G.N.R.R. Sur. .. Run. 6⅝-in. csg. 2,805 ft.

Huey et als' No. 3 Smith et al, 330 ft. from N and 660 ft. from W of S 40 ac. of E 100 ac., SE, Sec. 12, Blk. Y ..... Drlg. 460 ft.

McMan O. & G. Co.'s No. 2 Sanford, 300 ft. from W line and 315 ft. from S line N 274 ac., Sec. 83, Blk. 46, H.&T.C. Sur. ..... T.D. 3,153 ft; T.P. 3,025-30 ft; to shoo.; C.O. 3,153 ft.

Midwest Explin. Co.'s No. 1 Garner et al, 330 ft. N and W, SE cor. NE, Sec. 124, Blk. 4, I.&G.N. Sur. ..... Location.

Midwest Explin. Co.'s No. 2 Garner et al, 330 ft. N and 1,650 f.. W, SE cor. NE, Sec. 124, Blk. 4, I.&G.N. Sur. Location.

Midwest Explin. Co.'s No. 2 Moore, 330 ft. from S, 1,320 ft. from W, Sec. 125, Blk. 4, H.&G.N. Sur. ..... Drlg. 2,550 ft.

O. B. Penney's No. 2 Johnson Bros., 330 ft. from S line, 330 ft. from W line W½ NE, Sec. 35, Blk. Y, A.&B. Sur. ..... $1,000,000 ft. gas 1,990 ft; drlg. 2,460 ft.

Pennowa Oil Co.'s No. 3 Smith, 330 ft. S and W, NE NW Sec. 7, Blk Y, N&C Sur. ..... Drlg. 1,860 ft.

Phillips Pet. Co.'s No. 1 Cheatham, 427 ft. N and 330 ft. W SE cor. SE SE, Sec. 38, Blk. Y ..... Drlg. 2,650 ft.

Phillips Pet. Co.'s No. 1 Johnson Bros., 330 ft. from N and W lines NW, Sec. 34, Blk. Y, A.&B. Sur. ..... Pay 2,951-72 ft; initial prod. 1[illegible] bbls. oil and 5,000,000 ft. gas; S.D. 3,007 ft.

Phillips Pet. Co.'s No. 1 Johnson-Kotz, 350 ft. N and 330 ft. E SW W ½ SW, Sec. 35, Blk Y ..... Drlg. 2,425 ft.

Phillips Pet. Co.'s No. 4 Johnson, Sec. 28, Blk. Y, A.&B. Sur. ..... 2,000,000 ft. gas; set 8-in. csg. at 2,826 ft; T.D. 2,858 ft; T.P. 2,848 ft; I.P. 115 bbls; changing tools.

Phillips Pet. Co.'s No. 6 (Florence), 330 ft. each way from S and W lines, E½ ..... T.D. 2,876 ft; T.P. 2,805 ft; I.P. 70 bbls; shot 54 qts. 2,788-2,[illegible] ft; fishing csg.

Prairie O. & G. Co.'s No. 4 Cal Merchant, 5,612 ft. S 330 ft. E. NW, Sec. 37, Blk. 47, H.&T.C.R.R. Sur. ... S.D. 1,245 ft.

Prairie O. & G. Co.'s No. 4 Shaw, 330 ft. S and 990 ft. W NE cor., Sec. 27, Blk. Y ..... C.O. 2,675 ft.

Skelly Oil Co.'s No. 2 Lee Bivins, 306 ft. from E and 1,242 ft. from S line, S 160 ac. of N 320 ac., Sec. 34, Blk. 46, H.&T.C.R.R. Sur. ..... Drlg. 360 ft.

Skelly Oil Co.'s No. 3 Whittenburg, 330 ft. from S and 2,230 ft. from W, Sec. 22, Jameson Sur. ..... Drlg. 2,892 ft.

Skelly Oil Co. No. 7 Whittenburg, 330 ft. from S and 1,570 ft. from W lines, Sec. 22, Jameson Sur. ..... Top pay 2,918 ft; swbng. 142 bbls. C.O. 2,959 ft.

Sunny Jim Oil Co.'s No. 3 Pitts, 330 ft. N and W, of most southerly SE cor., Sec. 9, Blk. M-21, T.C. Sur.. Location.

The Texas Company's No. 2 Quinn, 990 ft. N, 330 ft. E SW cor. E½, Sec. 7, Blk. 9, I.&G.N. Sur. ..... T.D. 3,090 ft; T.P. 3,060-80 ft; swbd. 85 bbls. first 15 hrs.

Travelers Oil Co.'s No. 2 Cockrell, 350 ft. from E and S line, Sec. 8, Blk. B-3, D.&S.E. Sur. ..... S.D. 1,875 ft.

KING COUNTY

Huff Oil Co.'s No. [illegible] 320 ft. from N line and 1,320 ft. from [illegible] t, Blk. F. H.&T.C. Sur... Rig.

LAMB COUNTY

Graham O. & G. Co. et als' No. 1 Ellwood, CWL, Sec. 9, Blk. T, T. A. Thompson Sur. ..... S.D. 2,750 ft.

LIPSCOMB COUNTY

Brown et als' No. 1 Box T Ranch, SW NE, Sec. 612, H.&T.C. Sur. ..... S.D. 3,210 ft.

Okla. Public Service Co.'s No. 1 C. W. Jones, NE SW, Sec. 100, H.&T.C. Sur. ..... Drlg. 4,627 ft.

LUBBOCK COUNTY

Center Oil Co.'s No. 1 Bowles Ranch ..... Small show oil 1,132-40 ft.; sand. S.D. 4,167 ft.

MOORE COUNTY

Amarillo Oil Co.'s No. 1 Read-A, C NW, Sec. 14, Blk. 13-12, D.&P. Sur. ..... Fishing 1,975 ft.

Amarillo Oil Co.'s No. 1 Perkins-A, 330 ft. each way out of NW cor. NE, Sec. 76, Blk. 3 ..... Drlg. 1,400 ft.

Red River Gas Co.'s No. 1 J. M. Shelton, 330 ft. each way from SE cor., Sec. 52, Blk. 3, G.&M. Sur. ..... Rig on ground.

Dana O. & G. Co.'s No. 1 Anthony, C NW, Sec. 280, Blk 44, H.&T.C.R.R. Sur. ..... Drlg. 2,040 ft.

Dana O. & G. Co.'s No. 1 Road-A, C NW, Sec. 14, Blk. B-13 ..... Location.

Fritch O. & G. Co.'s No. 1 Lee Bivins, C NE 40 ac. of N 160 ac., Sec. 4, Geo. Mahan Sur. ..... 2,000,000 ft. gas 1,550-65 ft; S.D. 2,180 ft.

Phillips' No. 1 Wilson, 330 ft. each way out of NW cor. S½ SE, Sec. 157, Blk. 3-T ..... 5,000,000 ft. gas 2,773-2,918 ft; S.D. 3,180 ft; 34,000,000 ft. gas 3,143-80 ft.

MOTLEY COUNTY

Explin. Co.'s No. 5 Matador, C, Sec. 45, Blk. J-B, C. B.&C.N.G.R.R. Sur. ..... Drlg. 535 ft.

Explin. Co.'s No. 6 Matador, 330 ft. from N line and 330 ft. from E line, Sec. 132, Blk. M ..... S.D. 825 ft.

Matador Oil Corp.'s No. 1 Owen, C NE, Sec. 10, Blk. G, B.&B. Sur. ..... S.D. 580 ft.

POTTER COUNTY

Canadian River Gas Co.'s No. 1 Allison "A," 386 ft. from E line, 5,439 ft. from S line, Sec. 1, W. T. Palmer Sur.. Location.

RANDALL COUNTY

W. A. Patterson's No. 1 Palo Duro, Sec. 66, Blk. K-14 ... S.D. 1,250 ft.

ROBERTS COUNTY

Big Bend Oil Co.'s No. 1 Ledrick, Sec. 7, Blk. 5-A ..... T.D. 5,992 ft; will P.B. and shoot show oil 5,288-91 ft.

WHEELER COUNTY

A. R. Anderson et als' No. 1 Cuddleback, C SE NW, Sec. 13, Blk. Z-4, H.&G.N. Sur. ..... Location.

Angus et als' No. 1 Linkey, C NE NW, Sec. 126, Blk 23... S.D. 1,400 ft.

Byrens et als' No. 1 Johnson, SW cor. NE, Sec. 33, Blk. A-5, H.&G.N. Sur. ..... S.D. 2,920 ft.

Fain et als' No. 2 Binkley & Cain, C SE, Sec. 5, Blk. 24, H.&G.N. Sur. ..... First gas 2,324 ft; S.O. 2,430 ft. T.D. 2,750 ft; S.O. 2,630 ft.

Johnson et als' No. 1 Hicks, C NW SW, Sec. 49, Blk. 17, H.&G.N.R.R. Sur. ..... S.D. 1,505 ft.

Johnson & Wisch Kamper's No. 1 West, C NE NW, Sec. 30, Blk. 17, H.&G.N. Sur. ..... 1,000,000 ft. gas 1,812-25 ft; S.D. 2,290 ft.

Kosmos Carbon Co.'s No. 1 Hick, C NW NW, Sec. 52, Blk. 17, H.&G.N.R.R. Sur. ..... Location.

Lone Star Gas Co.'s No. 3 Burcham, C NE SE, Sec. 91, Blk. 17, H.&G.N. Sur. ..... Drlg. 1,260 ft.

Murchison & Fain's No. 1 Close, C NE NE, Sec. 82, Blk. 23, H.&G.N. Sur. ..... Location.

Magnolia Pet. Co.'s No. 1 Laycock, 652 ft. from W and 660 ft. from N, SE, Sec. 9, Blk. 27, H.&G.N.R.R. Sur.. Drlg. 930 ft.

Osage Dev. Co.'s No. 1 Purcell, C SE NE, Sec. 51, Blk. 17, H.&G.N. Sur. ..... Drlg. 1,350 ft.

The Texas Co.'s No. 2 Sewell, 660 ft. S and W, NE cor. NW, Sec. 1, Blk. 24, H.&G.N. Sur. ..... Location.

Upham Gas Co.'s No. 1 Ladd, C NE, Sec. 97, Blk. 23, H.&G.N. Sur. ..... T.D. 1,650 ft.
Upham Gas Co.'s No. 1 Shelton, C SE NE, Sec. 23, Blk. 24, H.&G.N.R.R. Sur. ..... S.D. 1,235 ft.
Vaughn et als' No. 3 Ackley, 330 ft. from N, 330 ft. from W. Sec. 4, Blk. 27, H.&G.N. Sur. ..... Drlg. 1,800 ft; 5,000,000 ft. gas 1,660-1,770 ft.
Vaughan et als' No. 4 Ackley, 330 ft. N and E, SW cor. NW, Sec. 4, Blk. 27, H.&G.N.R.R. Sur. ..... T.D. 1,185 ft; run. 8¼-in. csg.
Vaughn et als' No. 5 Ackley, 330 ft. S and E. NW cor. NW NW, Sec. 4, Blk. 27, H.&G.N.R.R. Sur. ..... Spudding.

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 61)

Hickey & Stiver's No. 1 C. O. Finley, 600 ft. N and 1,980 ft. W Sec. 20, Blk. 32 ..... Small oil show 1,331 ft.; shut down 2,260 ft.; hole full water; elevation 3,874 ft.; shut down for 30 days.
West Coast Oil & Exploration Co.'s No. 1 McGregor, C NW Sec. 14, Blk. 51 ..... Total depth 720 ft.; straightening crooked hole; drlg. out cement.
Scott & Dittman's No. 1 Miller, 1,160 ft. N and 2,480 ft. E Sec. 1, Blk. 97, Public School Land ..... Rainbow 1,056 ft.; 300 ft. sulphur water 1,725 ft.; oil show 2,528 ft.; hole full sulphur water; shut down 2,886 ft.; running 6-in. casing.

ECTOR COUNTY

Anderson's No. 1 fee, 1,320 ft. E along N line Sec. 19, and 150 ft. N at right angles with line Sec. 18, Blk. B-16, Public School Land ..... Moving in material.
R. R. Penn et al's No. 1 Kloh-Rumsey, 330 ft. N and 2,640 ft. E of SW Sec. 7, Blk. 44, Twp. 3s, T.&P. R.R. Sur. ..... Drlg. 785 ft.; no water or salt.

EL PASO COUNTY

Laytex' No. 1 Malone, 2,200 ft. SW and NW Sec. 46, J. M. Day, Sur. ..... Shut down 1,107 ft.; running 10-in. csg.; froze; trying to free.

EDWARDS COUNTY

A. M. Griffith's No. 1 Wardlow, Sec. 60, V-8, J. C. Clift Sur. ..... Shut down 3,000 ft.

FISHER COUNTY

Bickerstaff et al's No. 1 McWhirter, 2,640 ft. E and 150 ft. N of SW cor. of Sec. 295, Blk. 2, E.&T.C. Sur. ..... Shut down 2,000 ft. for orders.
Cranfill & Reynolds' No. 1 Flanagan, 990 ft. from S and W of Sec. 200, Blk. 1, B.B.B.&C. Sur. ..... Show oil 2,875 ft.; drlg. 3,120 ft.
Cranfill & Reynolds' No. 1 Texas Cement, Sec. 10, 330 ft. from N and W of most westerly NW cor. ..... Drlg. 775 ft.
Magnolia Pet. Co.'s No. 1 Lee, Sec. 357, 2,310 ft. from N and 4,286 ft. from W ..... Drlg. 2,600 ft.
Mesa Oil Co.'s No. 1 Griffin, 849 ft. N and 465 ft. E of NE cor. Sec. 20, School Land ..... Shut down 2,985 ft.
Midwest Oil Co.'s No. 1 Steele, 660 ft. from S, 440 ft. from W Sec. 210, Blk. 1 ..... Drlg. 400 ft.
H. Riley's No. 1 J. H. Veatch, 250 ft. S and 990 ft. E of NW cor. Sec. 4, English Sur. ..... Drlg. 1,140 ft.
Rosser & Pendleton's No. 1 Johnson, 330 ft. from N, 3,870 ft. from W Sec. 71, Blk. 1, H.&T.C. ..... Drlg. 2,450 ft.
Rosser & Pendleton's No. 2 Haught, Sec. 191, Blk. 1, 590 ft. from N and 1,320 ft. from W ..... Top pay 3,123 ft.; shut down 3,125 ft.; swabbed and flowed 5 bbls. hourly for 12 hrs.
The Texas Company's No. 1-B Stephens, 330 ft. from N and W of S half SW Sec. 79, Blk. 1, H.&T.C.R.R. Sur. ..... Drlg. 1,840 ft.

GARZA COUNTY

Bell Thompson's No. 1 Tuffing, 330 ft. from S, 2,310 ft. from E Sec. 10, Blk. 6, H.&G.N. ..... Spudded and shut down 550 ft.
Emerald Oil Co.'s No. 1 J. C. Bargsley, 2,310 ft. from E and 330 ft. N of SW cor. Sec. 135, Blk. 5, H.&G.N. ..... Total depth 2,551 ft.; estimated 60 bbls. per day after shot.
Gulf Prod. Co.'s No. 1 Street, C Sec. 7, Blk. 8, H.&G.N. R.R. Sur. ..... Drlg. 3,940 ft.
Paul Steed et al's No. 1 Boren, Sec. 136, Blk. 5, 330 ft. from N, 990 ft. from E, H.&G.N.R.R. Sur. ..... Drlg. 900 ft.

GLASSCOCK COUNTY

The California Co.'s No. 3 Currie, 990 ft. S and 2,310 ft. W of NE cor. Sec. 219, Blk. 29, W.&N.W.R.R. Sur. ..... Rigging up.
Chas. Daniel et al's No. 1 Meek, 2,310 ft. W and 1,600 ft. N of SE cor. Sec. 7, Blk. 34, Twp. 3s, T.&P. Sur. ..... Shut down 500 ft.
Gibson-Johnson's No. 1 Dean, 1,320 ft. S and E of NW cor. Sec. 2, Blk. 33, Twp. 2s, T.P.R.R. Sur. ..... Top salt 1,075 ft.; top lime 2,560 ft.; drlg. 3,540 ft.
Houston Oil Co.'s No. 1 McDowell, 330 ft. from N and 2,310 ft. from E Sec. 30, Blk. 33, Twp. 2s ..... Shut down 2,603 ft.
Kirby Pet. Co.'s No. 1 Phillips, Sec. 23, Blk. 33, Twp. 3s, 330 ft. from N and 2,310 ft. from W ..... Top pay 2,212 ft.; 1,200 ft. fluid in hole; shut down 2,268 ft.; fishing pipe; hole full oil.
Kirby Pet. Co.'s No. 2 Phillip, 330 ft. from N and W Sec. 23, Blk. 33, Twp. 2s, T.&P.R.R. Sur. ..... Location.
Landreth and others' No. 1 Huston, Sec. 29, Blk. 35, Twp. 2s, 330 ft. from S, 2,310 ft. from E, T&P Sur. ..... Location.
Lion Oil & Ref. Co.'s No. 1 Coffee, 330 ft. from N and E Sec. 22, Blk. 33, Twp. 2s, T.&P.R.R. Sur. ..... Total depth 2,182 ft.; cleaning out.
Midwest Oil Co.'s No. 1 Edwards, 330 ft. from S, 2,259 ft. from E, Sec. 20, Blk. 34, T.&P.R.R. Sur. ..... Set 6-in. casing 2,543 ft.
Penn Oil Co.'s No. 1 Schaffer, 1,320 ft. from S, 2,640 ft. from E Sec. 4, Blk. 32, Twp. 3s, T.P.R.R. Sur. ..... Underreaming 2,185 ft.
Schermerhorn Oil Co.'s No. 1 Phillips, Sec. 23, Blk. 33, Twp. 2s, T.&P.R.R. Sur., 330 ft. N, 2,310 ft. E ..... Drlg. 1,025 ft.
Sun Oil Co.'s No. 1 Phillips, Sec. 14, Blk. 33, Twp. 2s, 330 ft. from S, 2,310 ft. from W ..... Drlg. 330 ft.
Texas State Oil Co.'s No. 1 Coffey, 330 ft. from S and 990 ft. from E Sec. 19, Blk. 34, Twp. 2s ..... Shut down 2,461 ft.
World Oil Co.'s No. 3-C McDowell, Sec. 21, Blk. 34, Twp. 2s, 330 ft. S and 2,310 ft. E of NW cor. ..... Rig up setting engine.

HOCKLEY COUNTY

World Oil Co.'s No. 1 Elwood, 320 ft. from N and W line, League 7, Wilbarger County School Land ..... Shut down 3,234 ft.

HOWARD COUNTY

Amerada Pet. Corp.'s No. 12 Roberts, 660 ft from S, 1,022 ft. from E. Section 128, Blk. 29 ..... Drlg. 835 ft.
California Co.'s No. 3 Roberts Lease No. 1, Sec. 137, Blk. 29, 1,654 ft. from S, 990 ft. from E, W.&N.W.R.R. Sur. ..... Drlg. 1,170 ft.
Continental Oil Co.'s No. 5-C Chalk, 1,140 ft. from N and 2,440 ft. from E, Sec. 140, Blk. 29, W.&N.W. R.R. Sur. ..... Location.
Continental Oil Co.'s No. 6-C Chalk, 1,520 ft. from N and 2,440 ft. from E, Sec. 140, Blk. 29, W.&N.W. R.R. Sur. ..... Location.
Continental Oil Co.'s No. 1 Kloh-Rumsey, 2,310 ft. S, 330 ft. W of NE cor. Sec. 13, Blk. 33, Twp. 2s, T.&P.R.R. Sur. ..... Location.
Continental Oil Co.'s No. 2 Kloh-Rumsey, 1,650 ft. S and 330 ft. w of NE cor. Sec. 13, Blk. 33, Twp. 2s, T.&P. Sur. ..... Location.
Continental Oil Co.'s No. 3 Kloh-Rumsey, 990 ft. S and 330 ft. W NE cor. Sec. 13, Blk. 33, Twp. 2s, T.&P. R.R. Sur. ..... Location.
Continental Oil Co.'s No. 9-A Settles, 220 ft. from N, 660 ft. from E Sec. 135, Blk. 29, W.&N.W.R.R. Sur. ..... Location.
Godley Pet. Co.'s No. 16 Hook, 1,520 ft. from N, 2,440 ft. from W, Sec. 140, Blk. 29, W.&N.W.R.R. Sur. ..... Location.
Gulf Prod. Co.'s No. 7 Clay, 330 ft. S and 990 ft. W of NE cor. W half Sec. 155, Blk. 29, W.&N.W.R.R. Sur. ..... Drlg. 1,542 ft.
Group No. 1 & Continental Oil Co.'s No. 7-A Settles, 1,650 ft. N and 2,310 ft. W of SE cor. Sec. 135, Blk. 29, W.&N.W.R.R. Sur. ..... Rig.
Group No. 1 & Continental Oil Co.'s No. 8-A Settles, 990 ft. N and 2,310 ft. W of SE cor. Sec. 135, Blk. 29, W.&N.W.R.R. Sur. ..... Rig.
Group No. 1 Oil Co. and Continental Oil Co.'s No. 9 Settles-A, 200 ft. S and 660 ft. W NE cor. Sec. 135, Blk. 29, W.&N.W. ..... Location.
Howard Oil Corp.'s No. 2 Kloh et al, 990 ft. from S and E of NW Sec. 5, Blk. 32, Twp. 2s ..... Total depth 2,330 ft.; top pay 2,315-25 ft.; pumped 3 bbls. per hour; preparing to test; pumping 35 bbls. daily; cleaning out.
Howard Oil Corp.'s No. 3 Abrams, 990 ft. from N and 330 ft. from W of Sec. 5, Blk. 32, Twp. 2s, T.&P. R.R. Sur. ..... Top pay 2,250 ft.; shut down 2,280 ft.
Humble Oil & Ref. Co.'s No. 4 Clay, 1,650 ft. from W, 330 ft. from S, Sec. 138, Blk. 29, W.&N.W.R.R. ..... Shut down 1,675 ft.
Laurel Oil & Cosden Oil Co.'s No. 14 Roberts, 1,600 ft. N and 330 ft. W of SE cor. Sec. 136, Blk. 29, W.&N.W.R.R. Sur. ..... Location.
Magnolia Pet. Co.'s No. 13 Dora Roberts, 2,440 ft. N and 1,650 ft. E of SW cor. Sec. 136, Blk. 29, W.&N.W. Sur. ..... Shut down 2,927 ft.; set 8¼-in. casing.
Marland Prod. Co.'s No. 3 Clay-F, 250 ft. S and 660 ft. W of NE cor. Sec. 138, Blk. 129, W.&N.W.R.R. Sur. ..... Shut down 2,675 ft. with show oil 2,595-2,675 ft.
McGinley et al's No. 2 Hyman, Sec. 92, Blk. 29, W.&N.W.R.R. Sur. ..... Rigging up.
Merriwether's No. 1 Smith, 150 ft. from S, 2,490 ft. from W Sec. 45, Blk. 33 ..... Shut down 425 ft.
Merrick & Bristow's No. 11 Hooks, Sec. 140, Blk. 29, 625 ft. from N, 2,015 ft. from W ..... Drlg. 1,903 ft.
Merrick & Bristow's No. 12 Hooks, 1,120 ft. from N and 2,440 ft. from W, Sec. 140, Blk. 29 ..... Location.
Merrick-Bristow's No. 9 Roberts, 1,155 ft. from S, 220 ft. from W Sec. 137, Blk. 29, W.&N.W.R.R. Sur. ..... Drlg. 1,398 ft.
Merrick & Lamb's No. 9 Clay, 660 ft. from S, 360 ft. from E. Sec. 126, Blk. 29 ..... Shut down 1,574 ft.
Moody Oil Co.'s No. 16-B, 990 ft. from N, 330 ft. from W Sec. 137, Blk. 29, T.&P. ..... Drlg. 1,325 ft.
Moody Oil Co.'s No. 19-B Roberts, Sec. 137, Blk. 29, 1,040 ft. from N, 2,310 ft. from W ..... Drlg. 247 ft.
Moody Oil Co.'s No. 20-B Roberts, 1,750 ft. from N and 2,310 ft. from W, Sec. 137, Blk. 29 ..... Shut down 243 ft.
Moody Oil Corp.'s No. 21-B Roberts, Sec. 137, Blk. 29, 2,310 ft. from N and 990 ft. from W, W&NW Sur. ..... Drlg. 1,300 ft.
Moody Oil Co.'s No. 22-B Roberts, 2,310 ft. from N and 1,610 ft. from W, Sec. 137, Blk. 29 ..... Drlg. 1,311 ft.
Moody Oil Co.'s No. 23-B, 990 ft. from N and W of Sec. 137, Blk. 29 ..... Shut down 261 ft.
Moody Oil Co.'s No. 19-E Roberts, 190 ft. from N and 2,310 ft. from E Sec. 136, Blk. 29 ..... Cellar.
Moody Oil Corp.'s No. 20-E, 1,650 ft. S, 2,310 ft. W of NE Sec. 136, Blk. 29, W.&N.W.R.R. Sur. ..... Location.
Owen & Sloan's No. 14 Roberts, 1,600 ft. from S, 330 ft. from E Sec. 136, Blk. 29, W.&N.W. ..... Location.
Plymouth Oil Co.'s No. 4 Abrams, 330 ft. from N and 1,650 ft. from W Sec. 5, Blk. 32, Twp. 2s ..... Drlg. 2,410 ft.
Plymouth Oil Co.'s No. 5 Abrams, Sec. 5, Blk. 32, Twp. 2s, 1,650 ft. from N, 330 ft. from W, T.&P. ..... Rigging up.
Shell Pet. Corp.'s No. 1-B Settles, 1,650 ft. from S, 2,310 ft. from W Sec. 135, Blk. 29, W.&N.W.R.R. Sur. ..... Drlg. 2,030 ft.
Shell Pet. Corp.'s No. 1 Kloh-Rumsey, 2,310 ft. from S and 330 ft. from E Sec. 13, Blk. 33, Twp. 2s, T.&P.R.R. Sur. ..... Shut down 2,030 ft.
Shell Pet. Corp.'s No. 2-A Roberts, 1,320 ft. from N, 1,650 ft. from W Sec. 156, Blk. 29, W.&N.W.R.R. Sur. ..... Drlg. 2,100 ft.
Simms Oil Co.'s No. 1 Clay, 330 ft. from S, 2,310 ft. from W Sec. 137, Blk. 29 ..... Drlg. 1,320 ft.
Sprague Oil Co.'s No. 8 Roberts, 990 ft. from N and 330 ft. from W, Sec. 156, Blk. 29, W.&N.W.R.R. Sur. ..... Location.
Superior Oil Co.'s No. 14 Dora Roberts-B, 2,310 ft. E and 280 ft. S of NW cor. Sec. 127, Blk. 29, W.&N.W. of SW cor. Sec. 137, Blk. 29, W.&N.W.R.R. Sur. ..... Shut down 2,601 ft.
Ward Oil Co.'s No. 8 Roberts, 1,485 ft. from S, 220 ft. from W Sec. 137, Blk. 29 ..... Drlg. 1,343 ft.
Ward Oil Co.'s No. 9 Roberts, 1,485 ft. from S, 220 ft. from W line of Sec. 137, Blk. 29, W.&N.W.R.R. Sur. ..... Drlg. 1,324 ft.
Ward Oil Co.'s No. 10 Roberts, 1,485 ft. from S and 640 ft. from W line Sec. 137, Blk. 29, W.&N.W.R.R. Sur. ..... Drlg. 200 ft.
Ward Oil Co.'s No. 11 Roberts, 2,430 ft. from S, 760 ft. from W line of Sec. 137, Blk. 29, W.&N.W. ..... Drlg. 150 ft.
Witherspoon's No. 3 Abrams, 920 ft. S, 723 ft. E, Sec. 3, Blk. 32 ..... Drlg. 320 ft.

HUDSPETH COUNTY

California Co.'s No. 1 University, 3,821 ft. N and 2,554 ft. E of SW cor. Sec. 19, Blk. E ..... Total depth 1,640 ft.; straight-reaming.
George Richardson's No. 1 Faxton, 2,640 ft. from N and W Sec. 9, Blk. 16 ..... Drlg. 140 ft.
Western States Oil Co.'s No. 1 Moore, C SE Sec. 16, Blk. 71, Twp. 6, T.&P. Sur. ..... Shut down 2,685 ft.; fishing job.
Western States Oil Co.'s No. 1 Gardner & Moseley, NE NW Sec. 12, Blk. 18 ..... Shut down 3,140 ft.; fishing.

IRION COUNTY

Brown & Fox's No. 2 Tankersley, 160 ft. from N and 500 ft. from E lines of S half of Sec. 712, F. Willig Sur. ..... Location.
Crawford Oil Co.'s No. 1 Williams, 450 ft. from N, 150 ft. from W Subd. 8 ..... Shut down 770 ft.
Carl Cromwell's No. 1 Nutt, 150 ft. from N, 1,160 ft. from W, Sub. 6, Gonzales County School Land ..... Location.
Carl Cromwell's No. 1 Tankersley, 2,490 ft. from S and E, Sec. 1,219, T.C.R.R. Sur. ..... Rigging up.
Fuhrman Pet. Co.'s No. 1 Nutt, 150 ft. from N and W, Subd. 4 ..... Location.
Kimbrough & Flinchbaugh's No. 1 Tankersley, 160 ft. S and 200 ft. W of NE cor. S half Sec. 712, Ford Willig Sur. ..... Show oil 1,318-29 ft.; total depth 1,335 ft.; averaging 60 bbls. daily 37 degrees gravity oil; shut down for storage.
Pecos Valley Oil Co.'s No. 2 Stocks, Sec. 19, Blk. 3, 1,020 ft. from S and W, H.&T.C. Sur. ..... Fishing 1,202 ft.
Webb's No. 2 Nutt, 200 ft. from N and 711 ft. from E Subd. 5 ..... Total depth 1,361 ft.; top pay 1,359 ft.
Kingwood Oil Co. et al's No. 1 J. D. Suggs, SE NW SE Sec. 19, Blk. 7, H.&T.C. Sur. ..... Show gas 7,656 ft.; drlg. 7,686 ft.
P. H. Williams' No. 1 Ash, C of Sec. 20, Washington County ..... Cleaning out 3,535 ft.

JEFF DAVIS COUNTY

J. K. Hughes Dev. Co.'s No. 2 Means, 1,622 ft. N line, 400 ft. W line Sec. 345, H.&T.C. Sur. ..... Show gas 3,271 ft.; fresh water 3,000-05 ft.; underreaming 5 3/16-in. casing; shut down 4,005 ft.; 600 ft. fresh water 4,000-26 ft.

JONES COUNTY

J. H. Adsit et al's No. 1 Swenson, C of NE of SE Sec. 193, B.B.B.&C. Sur. ... Spudding after skidding rig 50 ft. east.

Cosden-Herbert et al's No. 3 Bickley, 330 ft. N and W of SE cor. of S half NW Sec. 50, Blk. 18 ... Spudded.

W. G. Clark et al's No. 1 Collins, 330 ft. S and E of NW cor. Sec. 39, Blk. 18, T.&P.R.R. Sur. ... Underreaming 8-in. casing 2,308 ft.

Humble Oil & Ref. Co.'s No. 2 Bickley, 330 ft. S and W of NE cor. of SW Sec. 50, Blk. 18, T.&P.R.R. Sur. ... Drlg. 2,305 ft.

McNeeley et al's No. 1 Roscoe Bland, 1,175 ft. N and 240 ft. W of SE cor. Subdivision 20, A-164, DeWitt Co. School Land ... Spudded and shut down.

Sedgwick Oil & Gas Co.'s No. 1 Brown, 660 ft. N and 1,320 ft. E of SW cor. Sec. 9, Blk. 1, T.&N.O. Sur.... Drlg. 140 ft.

Texas Pacific Coal & Oil Co.'s No. 1 Smith, 1,822 ft. S and 2,042 ft. E of SW cor. Sec. 51, Blk. 18, T.&P... Top lime 2,499 ft.; top pay 2,480-85 ft.; swabbed 6 bbls. per hr.; drlg. 2,800 ft.

The Texas Company's No. 3 Camp, 1,189 ft. S and 326 ft. W of NE cor. of Sec. 13, Blk. 19, T.&P. ... Underreaming 5-in. casing at 2,860 ft.; drlg. 2,950 ft.

KIMBLE COUNTY

C. L. Bryant and others' No. 1 Lambert, 700 ft. from N and W line of F. Lotta Sur. ... Shut down 703 ft.

Lindsay Bros.' No. 1 Anderson, Sec. 167, 1,320 ft. from N and E ... Shut down 990 ft.

McLean & Jamison's No. 1 Cannon, 1,940 ft. N and 300 ft. W of SE cor. Robert Cochran Sur. ... Shut down 1,280 ft.

LOVING COUNTY

Humble Oil & Ref. Co.'s No. 1 Kloh, 2,640 ft. N and W Sec. 35, Blk. 55, Twp. 2, T.&P.R.R. Sur. ... Rig.

Lockhart & Co.'s No. 3 Allen, 330 ft. from NE, 1,650 ft. from NW, Sec. 82, Blk. 33, H.&T.C. ... Location.

Lockhart & Co.'s No. 3 Hubbard, 330 ft. from NE and SE, Sec. 83, Blk. 33, H.&T.C. ... Rigging up.

Lockhart & Co.'s No. 4 Hubbard, 1,650 ft. NE, 330 ft. NW, Sec. 83, Blk. 33, H.&T.C. ... Location.

Lockhart & Co.'s No. 1 Hayzell, 2,792 ft. SW of NE line and 660 ft. NW of SE line Sec. 84, Blk. 33, H.&T.C. R.R. Sur. ... Top salt 700 ft.; fishing 3,980 ft.; drilling by bit.

Lockhart & Co.'s No. 1-H Wheat, 990 ft. NE and SE Sec. 85, Blk. 33, H.&T.C. ... Total depth 3,197 ft.; plugged back 1,180 ft.; spraying 10 bbls. oil; cleaning out.

LYNN COUNTY

Lubewell Oil Co.'s No. 1 May, 2,310 ft. S, 2,310 ft. W, Sec. 10, Blk. 7, E.L.R.R. ... Shut down 100 ft.

George McCamey's No. 1 Edwards, 165 ft. N and E Sec. 5, Blk. 2, L.S.&W. Sur. ... Top salt 2,140 ft.; oil show 1,580-90 ft.; cem. 8¼-in. casing 2,500 ft.; shut down 4,500 ft.

MENARD COUNTY

J. C. Barnett's No. 2 Callan, Sec. 1, 1,050 ft. from S, 1,190 ft. W ... Drlg. 290 ft.

Cromwell & Duffey's No. 1 Winslow, C SE Sec. 32, T.&N.O. Sur. ... Show oil in lime 2,390 ft.; underreaming 6-in. casing 2,765 ft.; drlg. 2,990 ft.

MITCHELL COUNTY

Seiger's No. 1 Scott, C of NE of SW Sec. 36, Blk. 17, S.P.R.R. Sur. ... Shut down 730 ft.

Texas & Wheeler's No. 1 Radford, 1,320 ft. N and W of Sec. 1, Blk. 27, T.&P. Sur. ... Running 6⅝-in. casing; total depth 4,154 ft.

NOLAN COUNTY

Phillips Pet. Co.'s No. 1 Plunkett, 330 ft. N and W of SE cor. NW Sec. 66, Blk. 23, T.&P. Sur. ... Total depth 3,600 ft.; underreaming 8¼-in. casing.

PECOS COUNTY

M. M. Rowan's No. 1 University, C NE of Sec. 25, Blk. 16, University Land ... Drlg. 560 ft.

California Co.'s No. 5 Smith, Lease No. 1, 330 ft. from N, 2,405 ft. from W, Sec. 21, Blk. 194, G.C.&S.F. ... Building rig.

California Co.'s No. 8 Smith, Lease No. 1, 330 ft. from S and 3,097 ft. from W, Sec. 23, Blk. 194, G.C.&S.F. ... Drlg. 675 ft.

California Co.'s No. 19 Yates, Lease No. 1, Sec. 24, Blk. 194, 1,042 ft. from N and 1,919 ft. from E, G.C. & S.F. ... Drlg. 1,084 ft.

California Co.'s No. 20 Yates, Lease No. 1, 1,042 ft. from N, 2,591 ft. from W Sec. 34, Blk. 194, G.C. &S.F. ... Shut down 1,124 ft.

California Co.'s No. 1 University-Landrum, Sec. 13, Blk. 18, 330 ft. from S, 1,065 ft. from E, University Land... Rigging up.

Cosby's No. 2 Smith, Sec. 24, Blk. 194, 1,650 ft. from N, 330 ft. from E, G.C.&S.F.R.R. Sur. ... 1,000 ft. oil in hole; total depth 1,400 ft.; top pay 1,255 ft.; drlg. 1,575 ft.

Cowboy Evans' No. 1 Pecos Valley, 2,310 ft. from NW line, 990 ft. from SW line of Sec. 36, Blk. 3, H.&T.C. R.R. Sur. ... Top salt 1,215 ft.; drlg. 1,480 ft.

Crowey's No. 1 Heiner, 2,400 ft. each way from N and E lines Sec. 589, G.C.&S.F.R.R. Sur. ... Shut down 1,300 ft.

Clayton Williams' No. 1 Sanford, 160 ft. from NW line, 1,150 ft. from SW line Sec. 55, Blk. 10, H.&G.N. ... Show oil 1,390 ft.; shut down 1,526 ft.

Gibson-Johnson's No. 1 Grace, 330 ft. N, 990 ft. from E Sec. 3, Blk. 179 ... Total depth 1,793 ft.; skidding rig.

Gulf Prod. Co.'s No. 20-B Smith, Sec. 22, Blk. 194, 330 ft. from N, 2,322 ft. from E, G.C.&S.F. ... Spudding.

Gulf Prod. Co.'s No. 25 Yates, 1,015 ft. N and 8,083 ft. E of SW cor. R. C. School Land ... Location.

Gulf's No. 25 Yates, Sec. 3, Runnells County School Land, 1,015 ft. from S and 8,083 ft. from W ... Location.

Jayhawk Oil Co.'s No. 1 Price, 1,310 ft. from W, 330 ft. from S, Sec. 6, Blk. 12, H.&G.N.R.R. Sur. ... Drlg. 100 ft.

J. L. Kennedy's No. 1 Roberts, C of Sec. 78, Blk. 3, T.&P.R.R. Sur. ... Moving in machinery.

Sam Kitts and others' No. 1 Sherbino, 330 ft. from N and 990 ft. from W line Sec. 52, Blk. C-4, G.C.&S.F. R.R. ... Shut down 1,010 ft.; top salt 975 ft.

Landreth's Prod. Co.'s No. 1 University, 330 ft. from N and W lines of E half of SE Sec. 13, Blk. 18, University Land ... Shut down 950 ft.; estimated 66,000,000 ft. gas at 960 ft.; rig burned; shut in.

Seminole Oil Co.'s No. 1 Pecos Valley, Sec. 22, Blk. 10, 360 ft. from SW, 2,280 ft. from SE, E.&G.N. Sur.... Location.

Marland Oil Co.'s No. 1 University, Sec. 10, Blk. 17, 1,620 ft. from N, 1,020 ft. from E ... Top salt 950 ft.; 2,000,000 ft. gas 1,600-08 ft.; show oil 1,528 ft.; shut down 1,833 ft.

Mauch & Kroger's No. 1 Holmes, Sec. 5, Blk. 178, T.C. Sur. ... Shut down 1,442 ft.

McMan Oil & Gas Co.'s No. 3 Richardson, Sec. 102, 370 ft. N, 800 ft W of SW cor. Runnels County School Land ... Shut down 1,374 ft.

R. E. Moore's No. 1 Arnold, 1,320 ft. from S and 660 ft. from E lines of Sec. 18, Blk. 1, H.&T.C.R.R. ... Shut down 958 ft.; to run casing.

Moncrief's No. 1 Clarkson, Sec. 84, Blk. 11, H.&T.N.R.R. Sur., 2,310 ft. from N and W ... Location.

Moncrief et al's No. 1 Tippett, 330 ft. from S, 330 ft. E of C Sec. 36, Blk. 12, H.&G.N. ... Location.

Moncrief et al's No. 1 Toborg, 330 ft. from S, 330 ft. W of C of Sec. 539, Blk. 1 ... Show oil in sand 320 ft.; drlg. 370 ft.

Moncrief et al's No. 1 University, 1,470 ft. from N and 150 ft. from E Sec. 27, Blk. 18, University Land ... Drlg. 250 ft.

Moncrief et al's No. 2 University, 330 ft. from N, 2,310 ft. from W line of Sec. 13, Blk. 18, University Land... 20,000,000 ft. gas; total depth 1,665 ft.; flowing 120 bbls. daily.

Mid-Kansas Oil & Gas Co.'s No. 31 Yates, 220 ft. W, 1,355 ft. S of NW cor. Sec. 59, Blk. 1, I.&G.N. ... Spudding.

S. B. Owen's No. 1 Masterson, 330 ft. NE of SW line and 330 ft. NW of SE of Sec. 104, Blk. 10, H.&G.N... Location.

J. D. O'Mara's No. 1 Bennett, Sec. 595, 1,460 ft. from S, 150 ft. from E, G.C.&S.F. ... Drlg. 958 ft.

J. D. O'Mara's No. 1 Streety, C of Sec. 1, W. P. Howard Sur. ... Drlg. 810 ft.

Pecos Crude Oil Pur. Co.'s No. 3 Pecos Valley, 990 ft. from NW, 1,650 ft. from SW Sec. 22, Blk. 10 ... Top salt 1,115 ft.; drlg. 1,560 ft.

Perrin et al's No. 1 Eaton, 150 ft. each way from NE and NW lines Sec. 27, Blk. 39, H.&T.C Sur. ... 18,000,000 ft. gas 1,490-1,502 ft.; spraying salt water from behind 8¼-in. casing set at 1,180 ft.; shut down 1,502 ft.; 5 3/16-in. casing set on bottom with last joint perforated; 18,000,000 ft. gas shut in.

Perren's No. 1 Peterson, 150 ft. from NW, 150 ft. from SW Sec. 34, Blk. 10, H.&T.C. ... Shut down 1,846 ft.; show oil and gas 1,787 ft.; top salt 990 ft.

Phillips Pet. Corp.'s No. 2 Monroe, 990 ft. from N and E of Sec. 39, Blk. 194, G.C.&S.F. Sur. ... Shut down 1,385 ft.; top pay 1,346 ft.; flowing 30 bbls. daily.

Phillips Pet. Corp.'s No. 1 Southwestern Life Ins., 330 ft. from S, 2,310 ft. from W, Sec. 73, Blk. OW ... Drlg. 1,280 ft.

Plymouth Oil Co.'s No. 3 Perry, 1,655 ft. fromN, 1,650 ft. from E, Sec. 29, Blk. 178, T.C.R.R. Sur. ... Drlg. 350 ft.

Rowen & Tong's No. 1 McDonald, 1,170 ft. from N and 2,490 ft. from E Sec. 46, Blk. 2, H.&G.N. ... Fishing 1,577 ft.

B. J. Spikes' No. 1 George Brown, 2,490 ft. SE and SW line Sec. 3, Blk. 3 ... Show oil 1,180-90 ft.; shut down 2,257 ft.

Schumaker et al's No. 1 Williams et al, 330 ft. N of middle of S line Sec. 1, Blk. 117, G.C.&S.F. ... Shut down 1,483 ft.

Shell Pet. Corp.'s No. 1 Jackson, 330 ft. NW of SE line and 330 ft. NE of SW line, Sec. 28, Blk. 8, H&TC Sur ... Top salt 1,020 ft.; drlg. 1,427 ft.

Shell Pet. Corp.'s No. 1-B University, 1,650 ft. from S and 330 ft. from W Sec. 30, Blk. 16, University Land... Drlg. 1,325 ft.

Shell Oil Co.'s No. 1-C University, 1,661 ft. from N and 1,050 ft. from W, Sec. 31, Blk. 16, University ... Drlg. 855 ft.

Skelly Oil Co.'s No. 2 Tippett, 974 ft. N of No. 1, Sec. 108 ... Cleaning out 550 ft.

Southern Crude O. P. Co.'s No. 1 Jackson T-139, Sec. 28, Blk. 3, 1,487 ft. from NE, 2,518 ft. from SE cor.... Location.

Talbot and others' No. 1 Unsicker, 150 ft. each way from NE and SE cor. line of Sec. 25, Blk. 10, H.&G.N. Sur. ... Material on ground.

Taylor-Link's No. 2 University, Sec. 31, Blk. 16, 330 ft. from N and W ... Location.

Taylor-Link's No. 4 University, Sec. 31, Blk. 16, 990 ft. from N and W lines ... Location.

Texas-Phillip's No. 1 Campbell, 1,320 ft. from SW, 330 ft. from SE, Sec. 46, Blk. 10, H.&G.N. ... 1,000 ft. oil in hole; drlg. 1,865 ft.; oil from 1,710-13 ft.; hole fills 250 ft. in 12 hrs.

Tidal Oil Co.'s No. 2 University, 2,970 ft. from N, 2,310 ft. from E Sec. 3, Blk. 18, University Land ... Drlg. 1,200 ft.

Tidal Oil Co.'s No. 3 University, 2,310 ft. from S and 1,650 ft. from E Sec. 17, Blk. 20, University Land.... Drlg. 1,600 ft.

T wer & McKanna's No. 1 University, Sec. 14, Blk. 16, 2,310 ft. from N and E ... Location.

Tower & McKenna's No. 1 University, 330 ft. from S and EL line of Sec. 3, Blk. 17 ... Underreaming 955 ft.

Transcontinental Oil Co.'s No. 1 University, NE NW SW Sec. 18, Blk. 18 ... Top lime 1,155 ft.; shut down 4,405 ft.

Trees Oil Co.'s No. 2 Trees, 330 ft. from N and W of SE cor. Sec. 42, Blk. 3, H.&G.N.R.R. Sur. ... Drlg. 225 ft.

R. D. Webb's No. 2 fee, 1,665 ft. from N and 951 ft. from E line of Sec. 312, L. P. Scott Sur. ... Location.

World Oil Co.'s No. 1 University, 330 ft. from N and 2,310 ft. from E of Sec. 31, Blk. 16, University Land... Drlg. 323 ft.

World Oil Co.'s No. 1-B University, 330 ft. from N and E Sec. 13, Blk. 18 ... Shut down 905 ft.

PRESIDIO COUNTY

L. C. Brite's No. 4 Brite, 371 ft. from N, 1,188 ft. from E Sec. 245, Blk. 4 ... Shut down 670 ft.

Eastland Oil Co.'s No. 1 Tootle, C Sec. 17, Blk. 1, D.P. R.R. Sur. ... Spudded; shut down.

Phillips Pet. Co., Empire G. & F. Co., Delmar Co. and C. E. Miller's No. 1 Tootle Est., C NE Sec. 75, Blk. 3, D.&P.R.R. Sur. ... Slight oil show and gas at 2,707 ft.; show oil at 2,767 ft.; drlg. 4,010 ft.

T. P. Coal & Oil Co.'s No. 1 Bogel, 330 ft. S and W, Sec. 82, Blk. 8, G.H.&S.A. ... Drlg. 450 ft.

REAGAN COUNTY

Big Lake Oil Co.'s No. 1-C University, 2,598 ft. S and 250 ft. W of NE cor. Sec. 1, Blk. 2, University Land... Top pay 2,903 ft.; 1,000 ft. fluid in hole; drlg. 3,465 ft.

Kemrow Co.'s No. 1 Sawyer Cattle Co., 1,320 ft. from N and 1,980 ft. from E line Sec. 8, J. G. Robinson Sur. ... Location.

Skelly's No. 5 University, 1,392 ft. from W, 2,970 ft. from S line of Sec. 33, Blk. 8, University Land ... Location.

REEVES COUNTY

Exploration Co.'s No. 1 A. A. Kinney, 1,500 ft. W of NE cor. Sec. 26, Blk. C-18, Public School Land, elev. 2,847 ft. ... Shut down 2,900 ft.; pipe out.

H. T. Hansford's No. 1 Williams, 150 ft. from S and W Sec. 17, Blk. 6, H.&G.N. ... Spudded and shut down.

Black & Fink's No. 1 Brooks, 1,980 ft. N and 660 ft. W Sec. 16, Blk. 59 ... Drlg. 480 ft., gyp.

Southern Crude O. P. Co.'s No. 1 Kloh-Rumsey, 2,310 ft. N and W SE cor. Sec. 23, Blk. 51 ... Hole full water 1,275 ft.; cem. 12½-in. casing 1,463 ft.; shut down 1,535 ft. for orders; pipe parted, water broke in; skidded 75 ft. west; running 8-in. casing; drlg. 1,385 ft.

David R. Thompson's No. 1 A. A. Eddins, Sec. 9, Blk. C-1 ... Shut down 5,658 ft.; fishing 8-in. casing.

RUNNELS COUNTY

Herbert Oil Co.'s No. 1 Currie, 1,866 ft. SE of NW line, 335 ft. SW of NE line Gray Carroll Sur.... Underreaming 2,420 ft.

McLean et al's No. 1 G. W. Clayton, 150 ft. N line, 270 ft. from W line Sec. 135, E.T.R.R. ... Shut down 1,185 ft.

Vacuum Oil Co.'s No. 4 McMillan, 555 ft. S and 717 ft. W of NE cor. Lot 23, Domingo Diaz Sur., No. 532.... Location.

SCHLEICHER COUNTY

Fort McKavet's No. 1 Tisdale, Sec. 1,499, River Section, 3,630 ft. from S, 150 ft. from W ... Set 6-in. casing 3,023 ft.; shut down 3,500 ft.

Interstate's No. 1 Whitten, 1,320 ft. from N and W Sec. 35, Blk. LL, T.C.R.R. Sur. ... Hole slopped over with oil at 4,925 ft.; made one good flow; drlg. 4,987 ft.

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WILDCAT OPERATIONS IN SOUTHWEST TEXAS

(Continued from Page 52)

COLORADO COUNTY

Cagle-Concord Oil Co.'s No. 1, Sec. 42.....Spudded in.

DUVAL COUNTY

Magnolia Petroleum Co.'s No. 1 Corbett, Sur. 96 .....Drlg. 3,616 ft.
National Oil Co.'s No. 2 Ball, Agua Poquita Sur., Blk. 3..Derrick.

EDWARDS COUNTY

A. M. Griffith's No. 1 Wardlaw .....Fishing 2,600 ft.

FAYETTE COUNTY

Magnolia Petroleum Co.'s No. 1 Henry Gully.....Drlg. 3,410 ft.
National Oil Co.'s No. 1, A. Hanger Williams League.....Drlg. 1,600 f..
W. J. Kelly's No. 1 Burke .....Changing to heavier rig, 280 ft.
Marshall & Moore's No. 1 John A. Kerr.....Drlg. 2,485 ft.

GOLIAD COUNTY

Mission Drlg. Co.'s No. 3 Roy Rand, 3 miles E of No. 2.
This formerly carried in Bee County, Pettus Pool....To drill in on bail 4,053 ft.
Western Union Oil Co.'s No. 1 Lucas, Juan Moya y Delgado Sur. .....Location.

GONZALES COUNTY

Joe Bruner's No. 1 R. D. and J. C. Miller.....Shut down 2,712 ft.
Crown Petroleum Co.'s No. 1 Hattenback .....Shut down 2,330 ft.
Finnell & Elam's No. 1 Robinson, Liverpool Survey.....Shut down 1,260 ft.
Hoffman and others' No. 1 Booker, J. Stewart Sur.....Shut down 410 ft.
L. L. Jones' No. 1 J. F. Kindred, W. W. Barnes Sur., 700 ft. W line, 1,000 ft. S line .....Location.
Linderman Brothers' No. 1 F. H. Frampton.....Shut down 1,160 ft.
Fort Bend Oil Co.'s No. 1 C. E. Ham.....Shut down 2,670 ft.
Frank Sorrell's No. 2 Wilkenson.....Standing 174 ft.
A. G. Kifer's No. 1 B. B. Dix .....Drlg. 1,400 ft.

GUADALUPE COUNTY

Burgess' No. 1 Lennen .....Drlg. 2,400 ft.
Sights et al's No. 1 S. Hensel .....Shut down.
Sinclair Oil & Gas Co.'s No. 1 Ed Tewes .....Drlg. 1,972 ft.
L. W. Stieren's No. 1 S. H. Herman, Ragsdale Survey....Standing 1,233 ft.
R. R. Penn's .....Set casing 2,418 ft.
Adams-Lyles-Walton's No. 1 Zoluroski, Jesus Cantu Sur..Shut down 975 ft.

HAYS COUNTY

E. A. Bucklin's No. 1 .....Set casing 540 ft.

JIM HOGG COUNTY

Deep Rock Oil Co.'s No. 1 Kelsey .....Drlg. 300 ft.

JIM WELLS COUNTY

E. W. Ogden's No. 1 G. Farris, M. Perez Sur.....Drlg. 610 ft.
Magnolia Pet. Co.'s No. 1 C. Cook, W. H. Sartain Sur., Blk. 45 .....Drlg. 75 ft.

KARNES COUNTY

L. B. Flowers' No. 1 R. L. Barnett, 4 mi. NE Karnes City.Spudded in.
G. G. Fisher et al's No. 1 Barnett, 6 miles N of Karnes City .....Drlg. 260 ft.; set and cemented 10-inch csg.
Hurador Oil Co.'s No. 1 W. E. Porter.....Drlg. 2,160 ft.
Scott Townsend and others' No. 1 Ruckman.....Standing 2,500 ft.

KERR COUNTY

L. R. Page and Associates' No. 1 Real .....Drlg. 3,506 ft.

KIMBLE COUNTY

Carl L. Bryant's No. 1 C. E. Lambert .....Drlg. 150 ft.
H. A. McLean & Jamison's No. 1 R. F. Cannon.....Shut down 995 ft.
J. B. Lindsay's No. 1 G. C. Anderson .....Drlg. 785 ft.

KINNEY COUNTY

Lloyd Oil Co.'s No. 1 G. B. Moore, Survey 117.....Set csg. 1,653 ft.; total depth 1,675 ft.

LASALLE COUNTY

J. G. Nix's No. 1 Coleman, Survey 68.....Standing 500 ft.

LIVE OAK COUNTY

Dr. Frank Lynch's No. 1 Secrest, Simmons Tracts.....Drlg. 770 ft.

MAVERICK COUNTY

Ryan Consolidated Petroleum Co.'s No. 2 Indio Ranch....Drlg. 5,266 ft.
Rycade Oil Corp.'s No. 3 Chittim .....Drlg. 5,100 ft.
Rycade Oil Corp.'s No. 4 J. M. Chittim.....Drlg. 4,820 ft.
Rycade Oil Corp.'s No. 4 Sullivan .....Drlg. 4,280 ft.
Rycade Oil Corp.'s No. 5 Chittim .....Clearing land for rig.
The Texas Company, 5 miles west Darling Switch.....Drlg. 1,103 ft.

MEDINA COUNTY

R. C. Hill's No. 1 A. Wuezbach, G. Arcola Sur., 500 ft. E line, 600 ft. S line .....Location.
Zig Zag Oil Co.'s No. 1 San Antonio Irrig. Kemp Sur....Drlg. 2,121 ft.
Pat Armstrong's No. 1 C. W. Butts .....Derrick.
California-Medina's No. 1 Rothe .....Drlg. 3,426 ft.
Trapshooter Reilly Oil & Royalties Co.'s No. 1 Adams, L. Fritz Sur. .....Spudded in.

MILAM COUNTY

J. M. Burkhead's No. 1 C. Weigham .....Drlg. 1,967 ft.
E. L. Chapman's No. 1 Johnson, J. J. Acosta Sur.....Shut down 1,385 ft.
E. L. Chapman's No. 1 E. G. Knight .....Shut down 1,970 ft.
Diggs and others' No. 1 Nolen .....Derrick.
Hill & Bonwell's No. 1 B. Booher, James Welch Survey..Drill stem stuck, 2,607 ft.
Lloyd Oil Corp.'s No. 1 Camp, Acosta Sur.....Derrick.
Lloyd Oil Corp.'s No. 1 San Clement, Fakes Sur.....Location.
Wilson and others' No. 1 Johnson & Stiles.....Location.
Elbert Williams' No. 1 Tom Shigue .....Drlg. 3,200 ft.
Milam Oil & Gas Co., 4 miles southeast of Rosebud.....Dry and abandoned 1,500 ft.
J. W. Stiff's No. 1 M. Winston, J. Leal Sur.....Location.
A. H. Wray's No. 1 D. D. Fowler.....Drlg. 964 ft.

McMULLEN COUNTY

Natt Holman's No. 1 Shiner, H. M. Brewer Survey.....Drlg. 1,515 ft.

NUECES COUNTY

Nueces River Basin Dev. Co.'s No. 1 F. C. Allen.....Drlg. 2,400 ft.
Pearson and others' No. 1 Bluntzer .....Standing 3,507 ft.
R. & G. Corp.'s No. 1 Elmily Wright Perkins.....Standing 3,510 ft.
R. & G. Corp.'s No. 1 Roberts.....Location.
R. & G. Corp.'s No. 1 Ragland.....Standing 3,002 ft.
Trinity Drillers and Sun Co.'s No. 1 Tompkins.....Drlg. 960 ft.

SAN PATRICIO COUNTY

Magnolia Petroleum Co.'s No. 1 C. Freeman, Sec. 57.....Drlg. 3,745 ft.
Houston Gulf Gas Co.'s No. 3 Welder .....Drlg. 4,931 ft.

STARR COUNTY

Smith & Adams' No. 1 Welch, Pedernal Sur.....Drlg. 200 ft.
Ohio Oil Co.'s No. 1 Bass, Por. 76, Blk. 71.....Drilling.
Milam Drlg. Co.'s No. 5 R. Allen, Blk. 147.....Location.
U. S. Oil & Gas Co.'s No. 1 Kelsey, Por. 76, Blk. 11.....Standing.

TRAVIS COUNTY

J. W. Allen's No. 1 McAngus, Westbrook Sur.....Location.

WEBB COUNTY

G. S. Lumpkin's No. 1 H. Yeager, Por. 33-34-35.....Location.
Usher Carson's No. 2 D. Benavides, Sur. 1,613.....Resumed drlg. 1,005 ft.

WILLIAMSON COUNTY

W. J. Harlan's No. 1 J. V. Stile, J. Bevil Sur., 600 ft. N line, 900 ft. E line .....Location.
F. M. Moss et al's No. 1 Kreuger, W. Cartwright Sur., SW cor. .....Location.
J. C. Hawkins, 1½ miles northwest discovery well.....Location.

WILSON COUNTY

R. M. Sherer's No. 1 Tummilson, A. Trevena Sur.....Drlg. 457 ft.
Grayburg Oil Co.'s No. 1 Tigler, Parrott Sur.....Coring 2,100-50 feet.
R. M. Sherer's No. 1 First State Bank of Stockdale,.. Moran Sur. .....Drlg. 220 ft.

ZAPATA COUNTY

Hill et al's No. 1 A. O. de Vela, Blk. 30, El Grullo Sur. .....Location.
National Oil Co.'s No. 1 D. B. Adams .....Standing 690 ft.
Buck & Coursey's No. 1 Garza, Blk. 47 .....Drlg. 1,474 ft.
Buck & Coursey's No. 1 Trevino, Sur. 1 .....Drlg. 450 ft.

ZAVALA COUNTY

Tritex Oil Co.'s No. 1 Clay Burns .....Drlg. 780 ft.
Tritex Oil Co.'s No. 4 West .....Drlg. 795 ft.
Tritex Oil Co.'s No. 1 Childress .....Drlg. 1,095 ft.

SOUTHWEST TEXAS FIELDS

(Continued from Page 52)

line, 2,950 feet east line at 4,800 feet, drilling.

Randado Field—Jim Hogg

Randado Oil Corp.'s No. 35 Palacious, Survey 291, Block 2, located 150 feet south line, 450 feet east line at 100 feet, standing.

Henne-Winch-Fariss Field

George S. Marshall's No. 4 Holbein, Survey 11, Block 10, Share 3, located 150 feet south and west lines has derrick up; No. 5 Holbein, Share 3, Block 10, Survey 15, located 150 feet north and west lines is derrick. Magnolia Petroleum Co.'s No. 1 F. G. Martinez, east half of Survey No. 6, located 150 feet north and west lines at 1,927 feet, drilling.

Alworth Field

Alworth, Stevens, Hill Co.'s No. 14 M. Garza, Survey 39, Block 8, located 204 feet southeast lines, 570 feet northeast lines at 1,016 feet, preparing to resume drilling.

Schott Field—Webb

Livingston & Payne's No. 1 Guerra-Ochoa, Survey 58, located 917 feet east line, 470 feet south line at 1,649 feet, standing.

Mid-Ojuelos Field

Crown Central Petroleum Corp.'s No. 1 E. Garcia, Survey 463, located 900 feet east line, 150 feet south line at 1,579 feet, tested dry, standing, waiting orders.

Carolina-Texas Field

Carolina-Texas Oil Co.'s No. 8 Benavides, Survey 683, Block 12, located 150 feet south line, 450 feet west line at 100 feet, drilling. Foster Barsley's No. 6 Webster, NE SW, Survey 684, located 150 feet south and east lines, rigging up. Trapshooter Reilly Oil & Royalties Co.'s No. 2 Benavides, Survey 685, located 1,170 feet west line, 150 feet north line at 2,100 feet, drilling.

Magnolia-Cole Field

Cole Petroleum Co.'s No. 61 Benavides, Survey 412, Block 12, located 313 feet east line, 160 feet north line at 38 feet, standing. Magnolia Petroleum Co.'s No. 1 J. G. Valdez, Survey 754, Block 15, located 150 feet south and west lines, derrick; No. 1 Benavides, N half, Survey 660, located 660 feet south and east lines, derrick; No. 1 M. Benavides, N half NW, Section 660, located 660 feet south and east lines at 4,005 feet, drilling; No. 1 C Benavides, Survey 662, located 660 feet north and east lines, rig.

Cole Gas Field

Southern Oil Co.'s No. 1 King-Harper, Survey 323, located 337 feet north line, 1,625 feet east line at 2,100 feet, drilling.

John J. O'Hern's No. 2 Benavides, SE NE, Survey 694, located 660 feet north and west lines at 1,800 feet, drilling. O. W. Killiam's No. 11 Bruni, Survey No. 3, 1,265 feet, drilling.

Jennings Field—Zapata

Blair & Acklin's No. 1 Trevino, Survey 66, Block 1, located 150 feet north and west lines, rigging up. O. W. Killam's No. 15 Cuellar, O. W. Killam 160-acre tract of 1,772-acre tract, is rigging up. Killam-Duggan's No. 6 Cuellar, Survey 277, located 1,050 feet south line, 2,900 feet east line, has spudded in. H. Muckelroy, Jr.'s No. 3 Trevino, Survey 412, Block 25, located 660 feet north and east lines, is rigging up. South Texas Production Co.'s No. 1 Roy Jennings, Mira Flores Survey, located 18,055 feet southwest lines, 11,040 feet southeast line at 2,565 feet, drilling; No. 5 Joe Jennings, Cerrito Blanco Survey, located 2,775 feet northeast lines, 1,585 feet northwest lines at 500 feet, drilling.

Mirando Valley Field

O. W. Killam's No. 1 Flores, Survey 240, located 850 feet southeast lines, 560 feet northeast lines at 1,260 feet, drilling.

Somerset Field—Atascosa

Schimmel Production Co.'s No. 3 H. F. Gayle, C.E.P.I.&M. Survey, Block 2, located 946 feet east of No. 1 is location.

Yoast Field—Bastrop

The Texas Company's No. 8 Yoast, A. Garcia Survey, location.

Pettus Field—Bee

Mission Drilling Co.'s No. 4 Ray, 150 feet northwest of No. 1 Ray is rigging up.

Dobrowolski Field—Bexar

Amelia Balzart's No. 3 J. P. Adams, 150 feet from road offsetting No. 1 Dobrowolski, has derrick up. F. H. Eckert's No. 4 Dobrowolski, 330 feet southwest of No. 3 location.

Joe Bruner Field—Caldwell

J. W. Allen's No. 1 Jackson, Spencer Morris Survey, 150 feet north and west lines, location. E. R. Brawn and C. O. Miller's No. 2 R. W. Carter, Gerren Hinds Survey, 300 feet north of No. 1, 150 feet north and west lines at 2,680 feet, showing considerable water. Forest Oil Co.'s No. 1 M. H. Woods, Isaac Weldon Survey, Block 35, south central part of lease, location; No. 1 T. Enriquez, Luling Townsite, Block 32, center of Lot 30, location. T. C. Hadley's No. 1 J. M. Hanson, James Hinds Survey, 150 feet south and east lines of W half of east 20 acres of J. M. Hanson farm. At 2,640 feet it was shut down: No. 4 Merriwether at 2,741 feet, swabbing much water, little oil.

Humble Oil & Refining Co.'s No. 1-B J. L. Northcut at 2,687 feet, drilling; No. 13 Moses-Baggett, James Hinds Survey, 1,189 feet south line, 450 feet east line at 2,691 feet in Edwards. Humble Oil & Refining Co. and Luling Oil & Gas Co.'s No. 7 C. F. Dye, James Hinds Survey, 150 feet north line, 450 feet east line at 2,630 feet, drilling; No. 6-A Floy Gray, 525 feet south line, 820 feet west lines at 2,683 feet, drilling; No. 8-A Floy Gray, James Hinds Survey, 150 feet south and west lines at 2,195 feet, drilling; No. 6-C Floy Gray, James Hinds Survey, 150 feet south and west lines at 2,655 feet, drilling; No. 7-C Floy Gray, James Hinds Survey, 450 feet west lines, 571 feet north lines at 2,671 feet, drilling; No. 7 T. A. Tiller, James Hinds Survey, 150 feet south line, 450 feet east line at 2,640 feet, drilling. Nash, Windfohr & Perry's No. 4 Wilson, A. Floyd Survey, 200 feet west lines, 350 feet north line, location. The Texas Company's No. 8 Merriwether at 2,786 feet, standing, shot casing.

Darst Creek Field—Guadalupe

Gulf Production Co.'s No. 1 C. Anderson, J. C. Darst Survey, 150 feet south and east lines, location; No. 1 Tadlock, Jacob C. Darst Survey, 150 feet northwest corner, location. The Texas Company's No. 1 Dallas Wilson, Jacob Survey, 750 feet west line, 150 feet north line at 2,608 feet, shut down; No. 2 Dallas Wilson, Jacob C. Darst Survey, 150 feet south and west lines is derrick; No. 2 L. Anderson, 150 feet out of the northeast corner at 685 feet, shut down; No. 3 L. Anderson, 150 feet north and west lines, location, corrected; No. 4 Lemmie Anderson is derrick.

Kingsville Field—Kleberg

Humble Oil & Refining Co.'s No. 4 Flato, Block 10, Section 40, 250 feet east line, 450 feet north line at 6,577 feet, tested big flow of hot salt water with little show of oil.

Cartwright Field—Live Oak

Houston Oil Co.'s No. 2-A Brown, M. B. Kilvin Survey, 1,200 feet northeast of No. 1 at 1,924 feet, drilling in shale.

Adams Field—Medina

Southern Gas Utilities Co.'s No. 22 M. M. Adams, F. Mumme No. 7, Block 23, located 2,308 feet west line, 644 feet south line at 400 feet, drilling.

Agua Dulce Field—Nueces

Agua Dulce Oil & Gas Co.'s No. 1 Otto Wolters, Section 34, Benton's Pasture at 2,047 feet, standing. R. & G. Corp.'s No. 1 Brown, George H. Paul Subdivision, C SE NW, Section 87, location.

White Point Field—San Patricio

Spencer & Rhodes' No. 2 The Texas Company fee, Lot 6, Roos Subdivision, 150 feet south and west lines of west 50 acres, derrick.

Nursery Field—Victoria

Humble Oil & Refining Co.'s No. 3-A Jay J. Welder, D.L.&C. Survey, 1,634 feet southeast lines, 736 feet southwest lines at 4,088 feet, drilling, has small show of oil in sand and lime.

COMPLETIONS

Caldwell County

Humble Oil & Refining Co.'s No. 7-B Clyant Smith, James Hinds Survey. Total depth 2,714 feet. Initial produc-

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tion 200 bbls. on pump. Humble Oil & Refining Co. and Luling Oil & Gas Co.'s No. 6 C. F. Dye, James Hinds Survey. Total depth 2,665 feet. Initial production 280 bbls. on pump. Nash, Windfohr & Perry's No. 4-C Davis, A. Floyd Survey. Total depth 2,719 feet. Initial production 65 bbls.

Guadalupe County

The Texas Company's No. 1 Lemmie Anderson, Jacob C. Dart Survey. Total depth 2,631 feet; 800 bbls.

Jim Hogg County

Magnolia Petroleum Co.'s No. 1 F. G. Martinez, east half of Survey 6. Total depth 1,922 feet; 30,000,000 feet gas, 620 pounds rock pressure.

Webb County

John J. O'Hern's No. 2 Benavides, SE of NE Survey 694. Total depth 2,329 feet; 47,000,000 feet gas.

Southern Oil Co.'s No. 1 King-Harper, Survey 323. Total depth 1,767 feet; 10,000,000 feet gas, approximately.

ABANDONED TESTS

Caldwell County

Humble Oil & Refining Co. and Luling Oil & Gas Co.'s No. 4-B Floy Gray, James Hinds Survey. Total depth 2,720 feet; dry and abandoned.

Guadalupe County

Cranfill & Reynolds' No. 1 L. G. Denman, A. S. Emmett Survey. Total depth 2,703 feet; dry and abandoned.

Webb County

O. W. Killam's No. 11 Bruni, Survey 3. Total depth 2,625 feet; abandoned.

Crown Central Petroleum Corp.'s No. 1 E. Garcia, Survey 463. Total depth 1,625 feet; dry and abandoned.

NEW LOCATIONS

Caldwell County

Humble Oil & Refining Co.'s No. 9-A Floy Gray, 450 feet west lines, 150 feet north lines, is rigging up. Its No. C-8 Floy Gray, 450 feet west line, 150 feet south line, rigging up.

Milam County

Texas Petroleum Development Co.'s No. 1 Milton Phillips 80 acres, J. J. Chambers Survey, in center of Rockdale pool, rigging up. This test is the first Edwards limé test inside the pool.

Jim Hogg County

W. R. Shankle's No. 2 Holbein, Survey 3, Las Animas grant, 150 feet north line, 450 feet west line, Block 11, Hogg Ridge Subdivision, location

Webb County

John J. O'Hern's No. 1 Valdez, Survey 754, located 660 feet north and east lines, location. O. W. Killam's No. 12 Bruni, Survey 3, Adams Subdivision, Bruni lands, Mariano Arispe grant, 150 feet southwest lines, 330 feet southeast lines, spudded in.

LOUISIANA-ARKANSAS

(Continued from Page 51)

28-21-10, Cotton Valley district of Webster Parish, Louisiana, total depth 4,689 feet, had sand from 4,682 feet and is bailing to test. Houston Oil Co.'s No. 2-A Wilson, Section 25-15-18, Mount Holly district of Ouachita County, Arkansas, is bailing to test 6 feet of sand, total depth 2,761 feet. Modisette and others, drilling No. 1 Union Sawmill, Section 1-18-14, Union County, Arkansas, cored sand showing oil from 2,239-44 feet and will make a drill stem test. Location is about 4 miles south of Champagnolle production and the same distance east of production in the old El Dorado East Field.

MISSISSIPPI

Two recent tests and cores from the Lauderdale Oil & Gas Co.'s No. 1 Lackey, Section 2-7-16, Lauderdale County, Mississippi, attracted interest from operators in this division, several of whom had representatives present from Shreveport and Texas centers, while others have staffs permanently located at Meridian where they are convenient to all the actual drilling under way in the State. A sand at 2,141-45 feet was thought to be the same as that which developed a good gas show in the same company's Topton well at 2,180 feet, but both cores and sand testers failed to show anything. Another sand at 2,205-9 feet was barren and a third core in the Eutaw was taken at 2,237 feet where the well is shut down waiting reports.

Philp Brothers' No. 1 James, Section 20-11-5, Yalobusha County, Mississippi, topped the Pennsylvanian at 2,808 feet, and was coring from 2,938-47 feet. In Hinds County Love Brothers are trying to get an additional 5,000 acres for their block on which they have about reached a trade with E. M. Jones of El Dorado, Ark., to drill and have raised $35,000 for the well. Southern Christian Institute's No. 1 fee, Section 29-6-4, is drilling lime at 127 feet. Ohio Oil Co. is blocking in the vicinity of Durant, Holmes County, and Hobby, Palmer & Evans of Shreveport are closing the gaps in a big block of acreage they have checkerboarded in Yazoo County in the vicinity of Bentonia which, if accomplished, will give them a practically solid block embracing the larger part of four townships. It is believed the block will be turned to the Amerada, which has had geophysical crews giving that part of the country a thorough "once over" for the last several weeks.

Carter Oil Co. has taken a half interest in a block of 10,000 acres held by J. D. Collett and associates of Fort Worth and the well to be drilled on it. Location for the well, which is to go 3,500 feet, has been made 330 feet north and 990 feet west of the center of Section 14-11-4w, a few miles east of Water Valley. F. E. West and others have derrick up for No. 1 May 113¾ rods south and 28 rods east NW cor. SW Section 22-10-1w, Yazoo County. Lincoln Oil & Gas Co., whose No. 1 Pat Case, in the NE NE Section 21-8-6e, Lincoln County, was reported some time ago "location abandoned," has financed its proposition, begun drilling and is making hole below 368 feet where 12½-inch surface string was cemented. Location is at the center of a 23,000-acre block and its elevation, 542 feet, is the highest topographically between the Gulf Coast and Holly Springs and geophysical work also has revealed a "high." The well is contracted to go 3,000 feet and if the log is at all favorable will go deeper "unless."

Robinson & Greer are below 1,000 feet on No. 1 Douglas Oil Co., Section 15-9-2w, Choctaw County, Alabama. Magnolia Petroleum Co., The Texas Company, Gulf Refining Co. and Ramsey Petroleum Co. are busy on the Hatchitigbee anticline and Jackson fault areas in this, southwestern, part of the State. Magnolia has three men buying leases and royalties in Choctaw, Washington and Clark Counties and the Gulf Refining Co. also is interested in the same area. Ramsey Petroleum Co., holding considerable acreage in Clarke County on the south end of the Jackson fault, has an agent buying more acreage on the fault and also on the Hatchitigbee. The Texas Company is reported buying acreage and royalty in the lower Peachtree anticline area in Wilcox County.

LOUISIANA-ARKANSAS PROVEN AREAS

NORTH LOUISIANA

BOSSIER PARISH—CARTERVILLE

Company, farm and location—	Remarks:
Delaware-Louisiana Dev. Co.'s No. 4 Bollinger, Sec. 38-23-11	Swbd. little mud and oil 3,150 ft; W.O.S.R.; T.D. 3,922 ft.

BOSSIER—BELLEVUE

H. L. Morgan et als' No. 1 Wetherbee, 200 ft. S, 200 ft. W, NE cor. SW SE, Sec. 21-19-11	Coring 1,171 ft.

BOSSIER—ELM GROVE

Ark.-La. P. L. Co.'s (Ark. Nat. Gas Corp.) No. 5-B Van Hoose, Sec. 36-16-12	Drlg. 145 ft.
J. F. Palmer's No. 4 McCann, Sec. 31-16-11	S.D. 1,910 ft.
Palmer Corp.'s No. 1 Roos, 660 ft. N, 660 ft. W, SE cor. NW, Sec. 23-17-12	Drlg. shale 1,586 ft.
Palmer Corp.'s No. 1 Roscoe, 660 ft. S, 660 ft. E, NW cor. NE NW, Sec. 14-17-12	Location.

CADDO PARISH—MOORINGSPORT

Falcon Oil Co.'s No. 1 Nunley, 3,212 ft. N, 5,591 ft. E, SW cor., Sec. 29-20-15	Bailing to test; T.D. 2,326 ft.
C. B. Moore's No. 1 Buckalew, 2,000 ft. N, 1,000 ft. W, SE cor., Sec. 30-20-15	Rigging up.

CADDO PARISH—DIXIE

Gold & Sklar's No. 3 Hunter, 330 ft. N, 300 ft. E, SW cor. SW NE, Sec. 17-19-14	Derrick.
Gold & Sklar's No. 4 Hunter, 330 ft. N, 300 ft. W, SE cor. SW NE, Sec. 17-19-14	Location.
Gulf Ref. Co.'s No. 3 Hunter, 300 ft. S, 300 ft. W, NE cor., Sec. 17-19-14	Location.
Ohio Oil Co.'s No. 3 Hunter, 330 ft. N and E, SW cor. NW NE, Sec. 17-19-14	S.O. 2,415 ft; bailed dry; S.D. 2,433 ft.
Ohio Oil Co.'s No. 4 Hunter, 330 ft. N and W, SE cor. NW NE, Sec. 17-19-14	Derrick.
Ohio Oil Co.'s No. 5 Hunter, SE cor. NE NW, Sec. 17-19-14	Coring black shale and broken lime 2,492 ft.
Standard Oil Co.'s No. 3 Henderson, 220 ft. N, 330 ft. W, SE cor. SW SE, Sec. 7-19-14	Derrick.
Standard Oil Co.'s No. 1 School, 330 ft. S, 330 ft. E, NW cor., Sec. 16-19-14	Location.

CADDO PARISH—OIL CITY

W. D. Chew's No. 5 fee, Sec. 33-21-16	Cmtng. bottom; T.D. 2,306 ft.
W. D. Chew's No. 1-C Levee Board, 2,490 ft. W, 1,470 ft. S, NE cor., Sec. 34-21-16	W.O.S.R. 1,826 ft.
W. D. Chew's No. 2-C Levee Board, 2,490 ft. W, 1,473 ft. S, NE cor., Sec. 34-21-16	Tested dry; W.O. 932 ft.
Gulf Ref. Co.'s No. 18-A Levee Board, 100 ft. S, 180 ft. E, NW cor. NE, Sec. 34-21-16	Spudded Aug. 1; cmtd. 10-in. 45 ft; 6⅝-in. 1,800 ft; 23 ft. broken sand; W.O.S.R; T.D. 1,823 ft.
Gulf Ref. Co.'s No. 19-A Levee Board, 700 ft. E, 220 ft. S, NW cor. NE, Sec. 34-21-16	Rigging up.
Magnolia Pet Co.'s No. 4 Levee Board, 330 ft. S, 330 ft. E, NW cor. NE NE, Sec. 7-20-15	Rig up.
Oil City Oil Co.'s No. 6 Curtis, 985 ft. W, 2,508 ft. S, NE cor. NW, Sec. 10-20-16	Cmtd. 6-in. 2,141 ft.
Shreveport Oil Corp.'s No. 1 Guy, NW NE, Sec. 32-21-15	Tested S.W. with show of oil; S.D. for orders; T.D. 2,300 ft.
Simplex Oil Co.'s No. 7 Youree-Randolph, 660 ft. N, 660 ft. W, C, Sec. 13-20-15	Tested 50,000 ft. gas 2,300 ft; S.D. for orders; T.D. 2,326 ft.
The Texas Co.'s No. 71 Levee Board, 1,150 ft. E, 700 ft. N, SE cor. SE, Sec. 27-21-16	Spudded Aug. 17; cmtd. 12½-in. 39 ft; drlg. 1,241 ft.
The Texas Co.'s No. 72 Levee Board, 725 ft. N, 210 ft. E, SW cor. SE, Sec. 27-21-16	Location.

CADDO PARISH—HOSSTON

Standish O. & R. Co.'s No. 12 Allen, 1,120 ft. W, 330 ft. S, C, Sec. 23-22-15	Cmtd. 6-in. 1,008 ft.

CADDO PARISH—LEWIS

Snake Creek Oil Co.'s No. 1 Levee Board, SW NW, Sec. 9-21-16	Tested dry with show of oil and S.W; S.D; T.D. 2,328 ft.

CADDO PARISH—PINE ISLAND

C. H. French's No. 6 Muslow, 1,150 ft. N, 600 ft. W, SE cor., Sec. 31-21-15	Derrick.
H. J. Bussa's No. 7 Huckaby-Odell, 300 ft. E, 100 ft. N, SW cor. N½ NE NE, Sec. 15-21-15	Spudded Aug. 14; cmtd. 10-in. 41 ft; 6-in. 1,410 ft.
Dixie Oil Co.'s No. 92 Dillon, SW NW, Sec. 13-21-15	Bailing to test 6,351 ft.

CLAIBORNE PARISH—HOMER

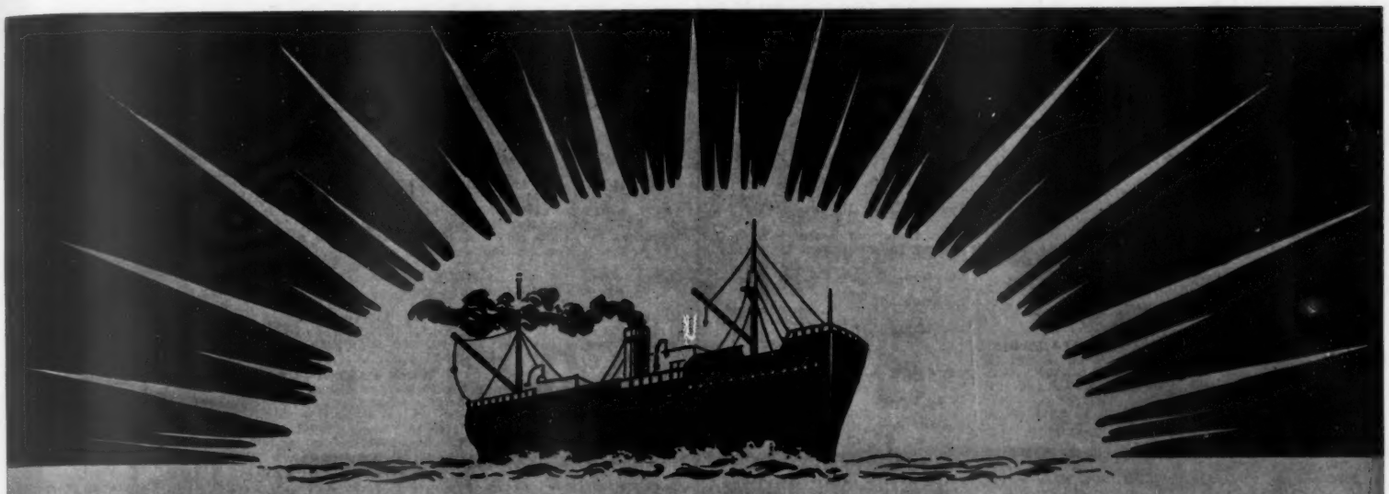
Oakes et als' No. 1 Richardson, NE SE, Sec. 19-21-7	S.D. 1,112 ft; in litigation.

CLAIBORNE PARISH—HAYNESVILLE

Smitherman & McDonald et als' No. 1 Miller, 825 ft S, 660 ft. E, C, Sec. 17-23-8	S.D. for orders; T.D. 4,780 ft.

LASALLE PARISH—URANIA

Air Lift Oil Co.'s No. 2 Mo.-Pac. R. R., 610 ft. W, 320 ft. N, SE cor. NW, Sec. 26-10-1e; formerly listed as Gardner et als' No. 1 Mo.-P.R.R.	Tested dry 1,532 ft; re-testing.



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Air Lift Oil Co.'s No. 3 Mo.-Pac. R. R., Sec. 26-10-1e .... Cmtd. 6-in. 1,514 ft. to test 13 ft. broken sand; T.D. 1,525 ft.

Kinney, Hardtner & Randall's No. 1 Kinney, SW SW, Sec. 7-10-2e .... S.D. 1,320 ft.

Philp et als' No. 1 Urania, SE cor. NE NE, Sec. 1-10-1e.. Tested 500,000 ft. gas and sanded up; C.O; T.D. 730 ft.

Randall et als' No. 3 Urania, Sec. 1-10-1e .... S.D. 675 ft.

G. W. Zoder's No. 3 King, 150 ft. N, 600 ft. W, SE cor. NE, Sec. 13-10-1e .... Cm.d. 6-in. 1,200 ft.

MOREHOUSE PARISH

Grecian Bend Gas Co.'s No. 1 Seacrease, 2,025 ft. S, 203 ft. W, NE cor. SE, Sec. 14-20-4 .... Cmtd. 6-in. 2,135 ft.

J. S. Herkness' No. 8 Bowles, 660 f.. S, 660 ft. E, NW cor. NE, Sec. 18-20-5 .... Drlg. 2,149 ft.

S D. Hunter's No. 10 Allison, 1,962 ft. E, 660 ft. S, NW cor., Sec. 18-20-5 .... Spudded Aug. 19; drlg. 100 ft.

Magnolia Pet. Co.'s No. 5 U. S., 620 ft. N, 330 ft. W, SE cor. NE SW, Sec. 29-21-5 .... Drlg. shale and boulders 2,185 ft.

Southern Carbon Co.'s No. 11 Tensas, SE SE, Sec. 31-21-4. Fishing for drill stem 2,094 ft.

Southern Carbon Co.'s No. 12 Tensas, 660 ft. S, 660 ft. E, NW cor., Sec. 2-20-4 .... Location.

United Carbon Co.'s No. 2 Patton, 660 ft. N, 660 ft. E, SW cor. SE, Sec. 2-20-4 .... Location.

United Carbon Co.'s No. 3 Patton, 660 ft. W, 660 f.. S, NE cor. SE, Sec. 2-20-4 .... Location.

OUACHITA PARISH

Ark.-La. P. L. Co.'s No. 2 McEnery, 221 ft. N, 660 ft. E, SW cor. NW, Sec. 21-19-4 .... Cmtd. 6⅝-in. 2,145 ft.

J. B. Bond's No. 2 McEnery, 660 ft. N, 660 ft. W, SE cor., Sec. 19-19-4 .... Drlg. 750 ft.

J. S. Herkness' No. 7 Bowles, 1,806 ft. E, 3,165 ft. S, NW cor. NE, Sec. 20-20-5 .... Tested S.W. 2,311 ft; plugging back.

Imperial O. & G. Co.'s No. 9 Stubbs, 150 ft. S, 150 ft. E, NW cor., Sec. 18-19-4 .... Rigging up.

G. E. Jordan's No. 1 Anding, NW NE, Sec. 18-18-5 .... Plugged back to 2,234 ft; T.D. 2,480 ft.

Jordan Drlg. Co.'s No. 4 J. Cole, 2,337 ft. N, 3,201 ft. W, SE cor., Sec. 1-18-3 .... Drlg. shale and boulders 1,850 ft.

La Del Prod. Co.'s No. 49 fee, 1,320 ft. N, 924 ft. W, SE cor. SW, Sec. 30-20-5 .... Cm.d. 6-in. 2,139 ft.

Mack & Pipes' No. 1 Schultz, 610 ft. E, 60 f.. S, southerly cor., Sec. 18-18-4, in Sec. 13-18-4 .... Tested 640,000 ft. gas 2,230 ft; drilled to 2,360 ft., dry; arranging to plug back to 2,230 ft.

Mack & Pipes' No. 2 Schultz, 2,777 ft. N, 300 ft. W, SE cor. SW, Sec. 13-18-4 .... Rigging up.

Mack & Pipe's No. 1 Slagle & Johnson, 1,294 ft. N, 309 ft. W, NW cor., Sec. 47, in Sec. 48-18-4 .... Spudded Aug. 16; cmtd. 12½-in. 201 ft; 8-in. 840 ft.

Magnolia Pet. Co.'s No. 2 fee 401, 660 ft. S, 660 ft. E, NW cor., Sec. 2-18-3 .... Location.

Magnolia Pet. Co.'s No. 2 fee 404, 660 ft. N, 660 ft. W, SE cor., Sec. 15-19-5 .... Cmtd. 8⅛-in. 2,250 ft; tested 3,000,000 ft. gas; T.D. 2,304 ft.

Magnolia Pet. Co.'s No. 3 fee 404, 660 ft. N, 660 ft. E. SW cor., Sec. 11-19-5 .... Location.

Magnolia Pet. Co.'s No. 4 U. S., Sec. 20-19-5; reported completed July 31, in error .... Bailing to test; T.D. 2,410 ft.

J. Potts, trustee's No. 3 Potts, 425 ft. N, 345 ft. E, NW cor., Sec. 47, in Sec. 7-18-4 .... Cm.d. 6-in. 2,123 ft.

Southern Carbon Co.'s No. 54 fee, 660 ft. N, 674 ft. W, SE cor. NE, Sec. 13-19-4 .... Cmtd. 6-in. 2,144 ft.

United Oil & Nat. Gas Products Co. of La.'s No. 2 Cole, 660 ft. S, 594 ft. E, C, Sec. 26-20-4 .... Derrick.

United Oil & Nat. Gas Products Co. of La.'s No. 5 Guthrie, 6,896 ft. N, 6,022 ft. W, cor. Secs. 49, 26, and 25, Sec. 49-20-5 .... Derrick.

RED RIVER PARISH

J. H. Askew's No. 1 Lockett, NW SW, Sec. 32-13-10 .... Standing 80 ft. in oil; W.O.S.R.; 2,820 ft.

Joe Danciger et als' No. 1 Pickett, 6,621 ft. S, 2,623 ft. W, NE cor., Sec. 15-13-11, in Sec. 23-13-11 .... Workover; arranging to shoot csg. at 900 ft. to test Nacatoch sand; completed in 1915 as Union Gas & Pet. Co.'s No. 1 Pickett.

Root Refineries, Inc.'s No. 1 Home State & Savings Bank, 330 ft. N, 330 ft. W, C, Sec. 8-13-10 .... Oil show 2,570 ft; drill stem test; S.W; cored sand showing gas 2,598 ft; S.D. 2,667 ft.

RICHLAND PARISH

W. C. Feazel's No. 1 Haynes & Vincent, 275 ft. S, 1,439 ft. E, NW cor. NE, Sec. 17-16-6 .... Drlg. gumbo 927 ft.

W. C. Feazel's No. 2 McCoy, 330 ft. E, 660 ft. N, SW cor., Sec. 32-16-6 .... Drlg. gummy shale 2,223 ft.

Feazel, Bendel & Brown's No. 1 J. H. Hunter, 660 ft. S, 660 ft. W, NE cor. NW, Sec. 23-16-6 .... Location.

Hope Prod. Co.'s No. 1 Boykin, 660 ft. N, 660 ft. E, SW cor. NW, Sec. 21-17-6 .... Location.

Hope Prod. Co.'s No. 1 Eubanks, NW SE, Sec. 26-17-6 .. Reaming to bottom; T.D. 2,919 ft.

S. R. Humble's No. 1 Binion & Sartor, 660 ft. S, 660 ft. E, NW cor. SW, Sec. 22-17-6 .... Tested dry 2,459 ft; arranging to deepen.

International Gas Prod. Co.'s No. 1-A Beck, 650 ft. S, 660 ft. E, NW cor., Sec. 33-16-6 .... Spudded Aug. 17; cmtd. 12-in. at 206 ft; 8-in. 850 ft.

Magnolia Pet. Co.'s No. 2 Hatch, 180 ft. N, 660 ft. W, SE cor. NE SE, Sec. 2-15-5 .... Location.

Magnolia Pet. Co.'s No. 4 C. M. Noble, 400 ft. S, 660 ft. W, NE cor. SE NE, Sec. 35-16-5 .... Location.

Magnolia Pet. Co.'s No. 1 B. F. Sartor, 1,087 ft. W, 737 ft. N, C, Sec. 17-16-6 .... Derrick.

M. L. Meredith's No. 1 Holdness, 1,980 ft. S, 990 ft. W, NE cor., Sec. 15-16-6 .... Derrick.

Northern La. Nat. Gas Co.'s No. 4 Boykin, Sec. 20-17-14. Cmtd. 12½-in. 266 ft; drlg. 288 ft.

Palmer Corp.'s No. 1 Boykin, 660 ft. S, 660 ft. E, NW cor. SW, Sec. 21-17-6 .... Spudded Aug. 18; cmtd. 15½-in. 184 ft.

Palmer Corp.'s No. 1 Eubanks, 1,100 ft. N, 350 ft. E, SW cor. SE NW, Sec. 26-17-6 .... Derrick.

Palmer Corp.'s No. 1 La. Pet. Co., Sec. 22-17-6 .... Pulling 4½-in. liner to deepen; T. D. 2,478 ft.

Palmer Corp.'s No. 4 Marshfield, 1,980 ft. E, 1,320 ft. N, SW cor. SW, Sec. 20-17-6 .... Rigging up.

Palmer Corp.'s No. 1 Mulhern, 660 ft. S, 1,320 ft. W, NE cor. NE, Sec. 29-17-6 .... Derrick.

Palmer Corp.'s No. 4 Rhymes, 660 ft. S, 1,320 ft. W, NE cor. NW, Sec. 28-17-6 .... Rigging up.

Southern Carbon Co.'s No. 1 Binion & Sartor, 660 ft. N, 1,320 ft. E, SW cor. SE, Sec. 21-17-6 .... Fish. for drill stem; T.D. 2,252 ft.

United Carbon Co.'s No. 1 Thornby, 660 ft. W, 650 ft. N, SE cor. NW NE, Sec. 12-16-6 .... Rigging up.

SABINE PARISH—PLEASANT HILL

Ark. Fuel Oil Co.'s No. 2 Horne, 860 ft. N, 300 ft. E, SW cor. SE SW, Sec. 33-10-12 .... Derrick.

Magnolia Pet. Co.'s No. 3 E. E. Hall, 460 f.. N, 200 ft. W, SE cor., Sec. 33-10-12 .... Rigging up.

UNION PARISH

Bahan & Bahan's No. 2 Peake, 1,425 ft. S, 100 ft. W, NE cor., Sec. 17-20-4 .... Spudded Aug. 19; drlg. 100 ft.

Bahan & Bahan's No. 2 School, 1,130 ft. N, 330 ft. W, SE cor., Sec. 10-20-3 .... Rigging up.

WEBSTER PARISH—COTTON VALLEY

La. Oil Ref. Corp.'s No. 9 Gray, 1,980 ft. S, 660 ft. W, NE cor. NW, Sec. 29-21-10 .... Spudded Aug. 19; cmtd. 12½-in. 490 ft.

Magnolia Pet. Co.'s No. 1 McCook & Hibbler, C SW SW, Sec. 22-21-10 .... Coring red sandy shale 6,733 ft.

Magnolia Pet. Co.'s No. 5-A Robbins, SE SW, Sec. 21-21-10 .... Reaming to set 8⅛-in.; T.D. 4,402 ft.

Ohio Oil Co.'s No. 44 Bodcaw, NW NW, Sec. 28-21-10 .... Coring 4,670 ft.

Palmer Corp.'s No. 1 Sally Coyle, 660 ft. S, 660 ft. W, NE cor. NE SW, Sec. 28-21-10 .... Rigging up.

WEBSTER PARISH—SAREPTA AND SHONGALOO

J. W. Clark, trustee's No. 1 W. B. Roseberry, W½ SE SW, Sec. 33-23-9 .... Standing 1,400 ft. fluid; little S. W.; 5 ft. sand; W.O.S.R.; T.D. 2,767 ft.

Pat Hudson's No. 1 Slack, SE NE, Sec. 1-22-9 .... Standing 1,200 ft. in oil; W.O.S. R.; T.D. 2,745 ft.

F. E. Estes' No. 2 Pardee, 1,270 ft. W, 50 ft. S, NE cor. NW, Sec. 3-22-11 .... Rigging up.

W. M. Kemp et als' No. 1 R. D. Campbell, 250 ft. S, 250 ft. W, NE cor. NW NE, Sec. 11-22-10 .... S.D. 2,653 ft.

Magnolia Pet. Co.'s No. 1 N. T. Knight, 330 ft. S, 330 ft. E, NW cor. SE SE, Sec. 33-23-9 .... Spudded Aug. 17; cmtd. 13⅜-in. 227 ft.

Magnolia Pet. Co.'s No. 1 Roseberry, 330 ft. N, 330 ft. W, SE cor. NW SE, Sec. 19-23-9 .... W.O.S.R.; 1,600 ft. oil, 30 ft. wtr. in hole; T.D. 2,763 ft.

Magnolia Pet. Co.'s No. 2 Roseberry, 330 ft. N, 330 ft. W, SE cor. NW SE, Sec. 19-29-9 .... Location.

Woodmansee et als' No. 1 Boyd, 200 ft. S, 200 ft. E, NW cor. SE SW, Sec. 3-22-11 .... Derrick.

WINN PARISH—URANIA

Gardner, Hunter & Brown's No. 15 Harper, 550 ft. N, 50 ft. E, SW cor. NW NE, Sec. 26-10-1e .... Spudded Aug. 19; cmtd. 10-in. at 104 ft.

Gardner, Hunter & Brown's No. 16 Harper, 330 ft. N, 400 ft. E, SW cor. NW NE, Sec. 26-10-1e .... Derrick.

ARKANSAS

NEVADA COUNTY

C. F. Steele's No. 1 E. W. Groves, Sec. 21-14-20 .... S.D. for wtr; T.D. 2,821 ft.

MOUNT HOLLY

Houston Oil Co.'s (was McDonald Bros.') No. 2-A Wilson, 330 ft. S, 330 ft. E, NW cor. NE SW, Sec. 25-15-18 .... Cmtd. 6⅝-in. 2,756 ft; T.D. 2,761 ft.

Houston Oil Co.'s (was McDonald Bros.') No. 4-B Wilson, 150 ft. N, 150 ft. E, SW cor. SW NW, Sec. 25-15-18 .... Derrick.

E. M. Jones' No. 1-A Wilson, 150 ft. S, 150 ft. W, NE cor., Sec. 26-15-18 .... Tested S.W. 1,655-69 ft; drlg. 2,145 ft.

E. M. Jones' No. 1-C Allen, 200 ft. N, 200 ft. E, SW cor., Sec. 25-15-18 .... Location.

OUACHITA COUNTY—SMACKOVER

L. H. Hamilton's No. 1 Arnold & Doyle, SE SE, Sec. 23-15-16 .... Standing 400 ft. in fluid; 23 ft. broken sand; T.D. 2,010 ft.

Magna Prod. Co.'s No. 10-B Linahan, NE cor. SE NW, Sec. 36-15-16 .... W.O.S.R; 100 ft. fluid from 2½-ft. sand; T.D. 2,012 ft.

Magna Prod Co.'s No. 11-B Linahan, 25 ft. NE of No. 10-B, in SW cor. SE NW, Sec. 36-15-16 .... Cmtd. 6⅝-in. 1,977 ft; T.D. 1,987 ft.

Phillips Pet. Co.'s No. 1 Clayton, 200 ft. N, 250 ft. W, SE cor. NW NE, Sec. 34-15-15 .... Spudded Aug. 14; cmtd. 10-in. 60 ft; 6⅝-in. 2,012 ft.

Phillips Pet. Co.'s No. 1 Scott, SE cor. SW NE, Sec. 34-15-15 .... W.O.S.R; 250 ft. oil; 22 ft. broken sand; T.D. 1,979 ft.

Phillips Pet. Co.'s No. 3 Scott, 250 ft. S, 200 ft. E, NW cor. SW NE, Sec. 34-15-15 .... Cmtd. 6⅝-in. 1,973 ft.

Standard Oil Co.'s No. 12 Arnold, 200 ft. S, 200 ft. W, NE cor., Sec. 26-15-16 .... Derrick.

Standard Oil Co.'s No. 13 Arnold, 200 ft. S, 200 ft. E, NW cor. NE NE, Sec. 26-15-16 .... Location.

Standard Oil Co.'s No. 8 Powell, 200 ft. S, 200 ft. W, NE cor. SE NW, Sec. 34-15-15 .... Location.

UNION COUNTY—CHAMPAGNOLLE

O. W. Estes' No. 1 Hargett, 200 ft. N, 200 ft. E, SW cor. SW, Sec. 13-17-14 .... Location.

Gann et als' No. 1 Doss, Sec. 10-17-15 .... Re-cmtd. 5 3/16-in. 3,160 ft; T.D. 3,240 ft.

Gann et als' No. 1 Schmidt, NW NW, Sec. 15-17-14 .... Derrick.

Oilwell Corp.'s No. 2-E Perdue, NW NW, Sec. 9-17-15 .. S.D. 3,265 ft.

Pure Oil Co.'s No. 10 E. F. Gregory, 359 ft. W, 123 ft. S, NE cor. SE SE, Sec. 10-17-14 .... Cm.d. 6⅝-in. 3,156 ft; T.D. 3,158 ft.

Rovenger Oil Corp.'s No. 3-B Perdue, 330 ft. S, 330 ft. W, NE cor. SE NE, Sec. 9-17-15 .... Tested 4 joints S.W. 2,752 ft; 30 joints S.W. 2,757 ft.

UNION COUNTY—EL DORADO

J. P. Hawkins' No. 1 Goodwin, Sec. 8-17-15 .... Tested 3,000,000 ft. gas; show of oil; standing 1,000 ft. in S.W.; fishing for drill stem; T.D. 3,210 ft.

Rice et als' No. 1 W. Raltey, 150 ft. S, 150 ft. E, NW cor. SW, Sec. 7-17-15 .... Spudded July 18; cmtd. 10-in. at 92 ft.

Weisinger et als' No. 1 Goodwin, Sec. 31-17-15 .... Running sand pump; T.D. 2,185 ft.

UNION COUNTY—SMACKOVER

E. L. Chapman's No. 1 Bradley, 510 ft. W, 150 ft. N, SE cor. SW NW, Sec. 2-16-16 .... Standing 300 ft. in fluid; W.O.S. R; T.D. 2,050 ft.

E. L. Chapman's No. 2 Bradley, 200 ft. N, 320 ft. E, SW cor. SW NW, Sec. 2-16-16 .... Derrick.

E. L. Chapman's No. 1 Purifoy, Sec. 2-16-16 .... Spudded Aug. 17; cmtd. 10-in. 100 ft; drlg. 400 ft.

E. M. Jones' No. 1 H. Murphy, 211 ft. S, 211 ft. E, NW cor. Lot 3, NW, Sec. 2-16-15 .... Location.

A. H. Ramage's No. 1-A James, Sec. 6-16-15 .... Ins alling vacuum system; T.D. 1,984 ft.

J. D. Reynolds' No. 1 fee, SE cor. SE SW, Sec. 27-15-15.. Rigging up.

EAST TEXAS

HARRISON COUNTY

Nick Barbare's No. 1 Abney, NE cor. J. J. Blair Sur. .... Derrick.

Nick Barbare's No. 17 Furrh, Joel Lipscomb Sur. .... Spudded July 27; cmtd. 10-in. 91 ft; 4½-in. 2,311 ft.

C. H. Lyons' No. 1-A Furrh, Joel Lipscomb Sur. .... Spudded Aug. 12; cmtd. 10-in. at 42 ft.

Mason et als' No. 1 Dean, J. W. Crofts Sur. .... Reaming to bottom; T.D. 2,385 ft.

PANOLA COUNTY

T. C. Adams' No. 6 Adams, B. C. Jordan Sur. .... Derrick.

T. C. Adams' No. 7 Adams, B. C. Jordan Sur .... Location.

Ark-La. P. L. Co.'s No. 1 Brumble, 541 ft. S, 544 ft. W, NW cor. J. Womack Sur., in B. C. Jordan Sur. .... Rigging up to deepen; T.D. 1,954 ft.

Eureka Nat. Gas Co.'s No. 1 Jeter, 300 ft. S, 300 ft. W, NE cor. John Womack Sur. .... Spudded Aug. 6; cmtd. 10-in. 32 ft; drlg. 440 ft.

S. H. Gardner's No. 4 Roquemore, 5,176 ft. E, 4,432 ft. S, NW cor. B. C. Jordan Sur. .... Location.

Magnolia Pet. Co.'s No. 4 T. C. Adams, E. Jones Sur. .... Coring lime 2,433 ft.

Magnolia Pet. Co.'s No. 16 Carrie G. Steele, B. C. Jordan Sur. .... Coring lime 2,390 f..; corrected depth.

Magnolia Pet. Co.'s No. 1 Leigh-Trosper, B. Stephenson Sur. .... Old well drilling deeper; rig up; T.D. 2,618 ft.

Natural Gas Prod. Co.'s No. 1 Maya, 1,550 ft. W, 500 ft. N, SE cor. Jane Thorpe Sur. .... Spudded July 29; cmtd. 10-in. 103 ft; drlg. 1,600 ft.

Paul C. Warren's No. 1 F. M. McNeese, A. Booker Sur. .. Derrick.

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WILDCAT OPERATIONS IN LOUISIANA-ARKANSAS

(Continued from Page 51)

DESOTO PARISH

P. J. Becker, trustee's No. 1 Tull, SW cor. NE NE, Sec. 23-12-15 ..... Fishing 7 joints drill stem; T.D. 2,475 ft.

Longstreet Synd.'s No. 1 Ramsey, NE cor. SW NE, Sec. 33-13-16 ..... Cbanging to heavy rig and arranging to sidetrack; T.D. 2,802 ft.

Fair et als' No. 1 Hamilton, 500 ft. N, 300 ft. W, SE cor. SE SE, Sec. 1-12-13 ..... Cmtd. 6-in. 2,668 ft; tested 3,000,000 ft. gas; bridged; drilled out found well dead; re-cmtng. 6-in.; T.D. 2,790 ft.

Magnolia Pet. Co.'s No. 1 Anna Mason, 990 ft. S, 990 ft. E, NW cor. SW, Sec. 27-12-11 ..... Location.

Magnolia Pet. Co.'s No. 2 W. H. Mason, 330 ft. N and W, C, Sec. 28-12-11 ..... Coring shale 2,953 ft.

R. O. Roy's No. 1 Rogers, Sec. 13-13-14 ..... S.D. 2,730 ft.

FRANKLIN PARISH

Davis et als' No. 1 Moore, 600 ft. W, 200 ft. S, NE cor. Sec. 12-11-6 ..... S.D. 1,430 ft.

JACKSON PARISH

Geo. O. Baird's No. 1 Tremont, SE cor. NW SE, Sec. 24-16-1w ..... Coring sandy shale 3,460 ft.

LASALLE PARISH

Tunica Pet. Co.'s No. 49 L. & A., 600 ft. S, 300 ft. W, NE cor., Sec. 17-7-2e ..... Cmtd. 6-in. 815 ft; oil sand 816-22 ft; arranging to test.

Tunica Pet. Co.'s No. 50 L. & A., Sec. 16-7-2e ..... Derrick.

Tunica Pet. Co.'s No. 51 L. & A., Sec. 16-7-2e ..... Rigging up.

MOREHOUSE PARISH

J. P. White's No. 1 Chess-Wymond, Sec. 32-19-6 ..... Tested S.W. 2,777 ft; arranging to deepen.

Rainbow Oil Co.'s No. 1 Louisville Cooperage Co., 990 ft. S and E, NW cor. NE, Sec. 33-22-8 ..... Derrick.

NATCHITOCHES PARISH

S. D. McDaniel's No. 2 Clark & Morse, 800 ft. E, 350 ft. N, C, Sec. 23-5-8 ..... Tested 1,000,000 ft. gas and S.W. 8 ft; S.D. for orders; T.D. 2,536 ft.

Nichols & Wilder's No. 1 Clark, 150 ft. W, 250 ft. N, SE cor., Sec. 10-10-8 ..... Rigging up.

Robeline O. & G. Co.'s No. 1, NE SW, Sec. 7-8-9 ..... Drill stem stuck; waiting orders; claim show gas; T.D. 3,230 ft.

OUACHITA PARISH

Haynes Oil Co.'s No. 1 Dixie Land Co., 957 ft. N, 3,960 ft. W, SE cor., Sec. 17, in H. R. 54-17-3, Sec. 17-17-3. Location.

Ouachita Nat. Gas Co.'s No. 2-B D'Arbonne, SE cor., Sec. 25-19-2e ..... Laying fuel line; arranging to deepen; T.D. 3,349 ft.

Farish & Russell's No. 1 School fee, NE, Sec. 16-16-4 .. Drlg. 4,325 ft.

RAPIDES PARISH

Ayers Bros.' No. 1 Wickliff, 2,790 ft. N, 150 ft. E, SW cor., Sec. 9-5n-2e ..... Derrick.

RED RIVER PARISH

W. D. Ball's No. 1 Krumholtz, 660 ft. S, 660 ft. E, NW cor., Sec. 32-14-10 ..... Rigging up.

Benedum & Trees Oil Co.'s No. 1 Franklin Realty Co., 350 ft. E, 350 ft. S, NW cor., Sec. 29-11-9 ..... Cmtng. bottom 2,120 f.

D. H. Riddick's No. 1 Johnson, 500 ft. N, 500 ft. W, SE cor., Sec. 17-12-10 ..... Rigging up.

RICHLAND PARISH

Austin & McDonald's No. 1 Millsaps, 660 ft. N, 1,980 ft. E, SW cor. NW, Sec. 17-17-6 ..... Tested 200,000 ft. gas; waiting orders; T.D. 2,510 ft.

Austin & McDonald's No. 2 Millsaps, SW cor., Sec. 17-17-6. Waiting orders; T.D. 2,679 ft.

Austin & McDonald's No. 3 Millsaps, 1,980 ft. S, 660 ft. E, NW cor., Sec. 16-17-6 ..... Drlg. gummy shale 1,970 ft.

Austin & McDonald's No. 4 Millsaps, NW cor., Sec. 16-17-6. Location.

Palmer Corp.'s No. 2 Miles, 723 ft. E, 660 ft. S, NW cor. NE, Sec. 12-17-6 ..... Drlg. gumbo and boulders 2,245 ft.

United Carbon Co.'s No. 1 Thornby, 660 ft. W, 650 ft. N, SE cor. NW NE, Sec. 12-16-6 ..... Rigging up.

SABINE PARISH

R. L. Gay's No. 1-A Bowman-Hicks, 900 ft. S, 200 ft. E, C, Sec. 34-8-12 ..... Derrick.

R. L. Gay, trustee's No. 4 Bowman-Hicks, SE cor. NW SE, Sec. 14-7-14 ..... Drlg. 1,000 ft.

R. L. Gay, trustee's No. 1 Long-Bell Lbr. Co., NE cor. NW NW, Sec. 26-8-14 ..... Drlg. hard lime 2,905 ft.

R. L. Gay, trustee's No. 2 Sabine Lbr. Co., Sec. 23-7-14 .. Drlg. sandy shale 2,780 ft.

A. H. Tarver's No. 1 Long-Bell Lbr. Co., NW cor. SW NW, Sec. 29-8-13 ..... Small show gas and mud; waiting orders; T.D. 3,535 ft.

A. H. Tarver's No. 2 Long-Bell, 800 ft. N, 800 ft. W, SE cor. SW, Sec. 18-8-13 ..... Spudded Aug. 18; cmtd. 10-in. 30 ft; drlg. 300 ft.

WEBSTER PARISH

F. M. Fuller's No. 1 Monzingo, 200 ft. N, 200 ft. W, SE cor., Sec. 27-18-8 ..... Derrick.

WEST CARROLL PARISH

W. F. Hyde, trustee's No. 1 Chickasaw Imp. Co., NE cor. NE, Sec. 24-23-11 ..... Spudded Aug. 17; drlg. 100 ft.

ARKANSAS

ASHLEY COUNTY

J. G. Marcum, trustee's No. 1 McGarry, 300 ft. W, 100 ft. S, C, Sec. 9-19-4 ..... Spudded Aug. 14; cmtd. 12½-in. 300 ft; drlg. 750 ft.

CALHOUN COUNTY

Phillips Pet. Co.'s No. 1 Freeman-Smith Lbr. Co., 300 ft. S, 300 ft. W, NE cor. SW NW, Sec. 25-16-13 ..... Drlg. 2,875 ft.

CLARK COUNTY

Wm. Henry, trustee's No. 1 Clark, Sec. 34-9-21 ..... S.D. 1,200 ft.

COLUMBIA COUNTY

Arpeco Synd.'s No. 1 Dennis, Sec. 11-20-23 ..... Tested S.W. 3,567 ft; drilled to 3,696 ft; tested dry; plugging back to 3,000 ft.

Helena O. & G. Co.'s No. 1 Pickler, Sec. 19-19-22 ..... S.D. 2,762 ft.

FAULKNER COUNTY

Gold Creek O. & G. Co.'s No. 1 Stermer, Sec. 17-4-13 .... T.A. 3,782 ft.

GRANT COUNTY

Jones & Watkins' No. 1 Meek, Sec. 5-4-11 ..... T.A. 1,400 ft.

JOHNSON COUNTY

Ark.-La. P. L. Co.'s No. 2 Bynum, Sec. 12-10-24 ..... Reaming at 3,100 ft; T.D. 3,125 ft.

Blackwell O. & G. Co.'s No. 1 Wyver, C SW SE, Sec. 21-9-25 ..... Drlg. 5,250 ft.

LINCOLN COUNTY

Pine Prairie O. & G. Co.'s No. 1 Carter ..... T.A. 2,176 ft.

LITTLE RIVER COUNTY

Grotte et als' No. 1 Allen, Sec. 31-12-31 ..... T.A. 2,941 ft.

McDonald & Shaw's No. 1 W. E. Black, 240 ft. N, 450 ft. W, SE cor. SE NE, Sec. 12-13-28 ..... Rig up.

LOGAN COUNTY

Ark. Nat. Gas Corp.'s No. 1 Hanna, Sec. 26-7-23 ..... C.O. under 7-in. csg; T.D. 3,165 ft.

MADISON COUNTY

Phillips Pet. Co. and F. S. Craver's No. 1, C. Sec. 11-14-23. Rigging up.

OUACHITA COUNTY

Copenhaven et als' No. 1 Warnick, Sec. 2-15-17 ..... S.D. 1,100 ft.

Flaucher et als' No. 1 Buck, Sec. 7-15-17 ..... S.D. 2,465 ft.

Geo. Khouri's No. 1 A. Wilson, 150 ft. N, 150 ft. E, SW cor. N½ SW SW, Sec. 24-15-18 ..... Drlg. 2,255 ft.

Lohman et als' No. 1 Fogle, Sec. 18-14-16 ..... S.D. 1,540 ft.

Sundby et als' No. 1 Farris, SW cor. NW SE, Sec. 27-15-15. Standing 100 ft. in fluid; 22 ft. broken sand; W.O.S.R; T.D. 2,093 ft.

The Texas Co.'s No. 1 Avery, 250 ft. N, 250 ft. E, SW cor., Sec. 35-15-15 ..... Location.

Timberlake et als' No. 1 Wright, Sec. 25-14-15 ..... S.D. waiting orders 2,907 ft.

Wesson et als' No. 1 Booth, Sec. 12-15-19 ..... S.D. 2,203 ft.

POPE COUNTY

Ark.-La. P. L. Co.'s No. 1 McFaddin, Sec. 15-19-21 ..... Location.

PULASKI COUNTY

Wonder State Dev. Co.'s No. 1 Wilson, 599 ft. W, 24 ft. S, NE cor. NE SW, Sec. 21-2-11 ..... Rig up.

UNION COUNTY

Addie & Modisette's No. 1 Union Sawmill, SW cor. SW SE, Sec. 25-19-12 ..... Location.

Joe Modisette's No. 1 U. S. M. Co., 1,120 ft. E, 200 ft. N, SW cor., Sec. 1-18-14 ..... S.D. for wtr; T.D. 1,575 ft.

Sam Arrendale's No. 1 Gallagher & Nelson, 200 ft. N and W, SE cor. Lot 5, Sec. 18-18-17 ..... S.D. 2,268 ft.

W. M. Coates, trustee's No. 1 McDuffie, Sec. 32-19-17 .... Cmtd. 6⅝-in. 3,942 ft; to test 4½ ft. sand; T.D. 4,057 ft.

O. W. Estes' No. 1 Ramsey, NW cor. NW SW, Sec. 24-17-14 ..... Derrick.

E. M. Jones' No. 1 Hardy & Murphy, 216 ft. N, 256 ft. W, SE cor. SW, Sec. 34-19-14 ..... Rigging up.

Ohio Oil Co.'s No. 1, Acct. 2, Stout Lbr. Co., 330 ft. S, 330 ft. W, NE cor. NE NW, Sec. 30-16-13 ..... Coring 2,799 ft.

McDonald Bros.' No. 1 Mayfield, Sec. 29-19-15 ..... S.D. 2,210 ft.

Stark et als' No. 1 Ainsworth, NE cor. NW NE, Sec. 8-19-16 ..... Derrick.

T. J. Woodley's No. 1 First Natl. Bank, NW cor., Sec. 34-19-18 ..... Derrick.

VAN BUREN COUNTY

Dr. J. S. Martin, trustee's No. 1 Scanlan, 200 ft. S, 200 ft. W, NE cor. SE NW, Sec. 5-9-13 ..... Drlg. 50 ft.

WASHINGTON COUNTY

C. H. Willoughby's No. 1 Jones, Sec. 34-16-30 ..... Cmtd. 6-in. 1,320 ft; S.D. 1,342 ft.

Lincoln Leaseholding Synd.'s No. 1 Lincoln, Sec. 30-15-32. S.D. 1,040 ft; repairs.

WHITE COUNTY

Letona Synd.'s No. 1 Letona, SE cor. NW SW, Sec. 35-9-8 Drlg. broken hard sandy shale 3,300 ft.

EAST TEXAS

BOWIE COUNTY

Hooks O. & G. Co.'s No. 1 Lee Roseberry, L. T. King Sur. Temp. abd; T.D. 3,086 ft.

CAMP COUNTY

Rogers et als' No. 1 Enfelt, R. M. Montgomery Sur. .... Tested dry 1,870 ft; S.D. 1,920 ft.

RED RIVER COUNTY

D. M. Buffington's No. 1 Hossler, E. Hughhart Sur. ..... Claim show oil and gas; S.D. 1,893 ft.

Shad Harper's No. 1 W. R. Garland, J. Wagley Sur. ..... S.D. 1,862 ft.

Johnson Pet. Co.'s No. 2 Randolph, Edward Dean Sur. .. S.D. 1,440 ft.

SHELBY COUNTY

Chapperall Oil Co.'s No. 2 Holt, Matthew Moore Sur. .... S.D. for orders 3,004 ft.

Gulf Ref. Co.'s No. 1 Carraway, J. H. Patterson Sur. .... Drlg. hard blue shale 5,948 ft.

MISSISSIPPI

ALCORN COUNTY

Alcorn Pet. Co.'s No. 1 Matthews, SE cor., Sec. 14-2s-7e.. Drlg. 2,350 ft.

CHICKASAW COUNTY

Hightower & Golson's No. 1 Flemming, NE cor., Sec. 20-13-3 ..... Quicksand 1,240 ft.

CLAIBORNE COUNTY

Ben W. White's No. 1 Shannon, NE cor., Sec. 36-0-4 .... Fish. for drill stem; T.D. 2,004 ft.

HINDS COUNTY

Harry Gerson's No. 1 Edward House, Blk. 16, West Jackson Subd. City of Jackson, in Twp. 5n, Range 1e .... Rig up.

Oscar Brown's No. 1 Riverside (formerly Hennessee et als'), SE cor. SE SW, Sec. 23-16-5 ..... Set 12½-in. 30 ft; S.D. 1,050 ft.

Mrs. Reeder et als' No. 1 State, SE cor. NW NW, Sec. 25-6-1e ..... S.D. 2,895 ft.

South. Christian Institute's No. 1 fee, SE SW, Sec. 29-6-4. Spudded Aug. 15; drlg. 100 ft.

HUMPHREYS COUNTY

E. C. Steele et als' No. 1 C. B. Box, SE cor. SE NE, Sec. 25-14-4w ..... Set 12½-in. 60 ft; S.D.

LAUDERDALE COUNTY

Lauderdale O. & G. Co.'s No. 1 Lackey, 990 ft. S and E, NW cor. NE, Sec. 2-7-16 ..... Ratholing 2,215 ft.

Meridian O. & G. Co.'s No. 1 Hauser, Sec. 33-8-18 ..... Drlg. 1,900 ft.

J. R. Smith Oil Co.'s No. 1 C. F. Craig, Sec. 2-6-14 ..... Derrick.

LINCOLN COUNTY

La.-Miss. Oil Co.'s No. 1 Pat Case, NE NE, Sec. 21-8-6 .. Spudded Feb. 17, 1929; S.D. 50 ft; resumed drlg. Aug. 12; cmtd. 12½-in. 368 ft.

MONROE COUNTY

Amory Dev. Co.'s No. 1 Bourland, Sec. 2-13-19 ..... S.D; waiting for 5 3/16-in. csg. 2,580 ft.

Amory Pet. Co.'s No. 1 Hall, Sec. 8-13-19 ..... Fish. for liner and tools 3,045 ft.

Arkansas Nat. Gas Corp.'s No. 1 Rye ..... Fish. drill stem; hard sandy shale 3,668 ft.

Park Bowser et als' No. 1 Cowart, second hole, Sec. 2-12-19 ..... S.D. 30 ft.

WARREN COUNTY

El Dorado Oil Co.'s No. 1 Dornbush, Sec. 8-18-5 ..... Drlg. 1,950 ft.

YALOBUSHA COUNTY

Philp Bros.' No. 1 James, Sec. 20-11-5 ..... Drlg. hard sand rock 2,947 ft.

TENNESSEE

DECATUR COUNTY

Standard Oil Co. of La.'s No. 1 Wyatt ..... S.D; repairing rig and waiting on heavier tools; T.D. 1,244 ft.

Chester County Oil Co.'s No. 1 Montgomery ..... Cmtd. 6-in. 1,040 ft.

ALABAMA

CHOCTAW COUNTY

Robinson & Greer's No. 1 Douglas Oil Co., 320 ft. N, C, Sec. 15-19-2 ..... Cmtd. 10-in. 319 ft; drlg. 1,000 ft.

LAMAR COUNTY

Briggs & Knapp's No. 1 Wefel, Sec. 25-12-14 ..... Drlg. Pennsylvanian 1,000 ft.

SUMTER COUNTY

B. W. Bates' No. 1 fee, Sec. 3-18-1 ..... U.R. surface csg. at 300 ft; to set 6-in.

WASHINGTON COUNTY

S. A. Hobson's No. 1 Hobson Bros., Sec. 9-8-2 ..... U.R. at 1,370 ft. in sand and shale.

S. A. Hobson's No. 1 Wilson, Sec. 27-7-1 ..... S.D. 700 ft.

CANADIAN FIELDS

(Continued from Page 57)

been started on Calmont's No. 3, same LSD.

McLeod Oil Co.'s No. 4, LSD 16, Section 1-20-3w5, is drilling below 5,150 feet, about 1,446 feet in the lime. The wet gas flow from the lower horizons has increased to 18,000,000 feet, and crude naphtha is being taken as drilling progresses.

Has 2,000 Feet of Oil in Hole

British Dominion Oil Development Corp.'s No. 2, LSD 6, Section 12-20-3w5, is reported drilling in the Fernie shales at 4,910 feet, with 2,000 feet of oil in the hole. The light crude was encountered in the Dalhousie sand but the test likely will be carried to the deep lime, which is expected around 5,100 feet.

Sentinel Oil Co.'s No. 1, Section 8-20-2w5, is reported drilling close to 5,000 feet with some shows of oil and gas.

In the north end of the Turner Valley, Spooner Oils' No. 2, Section 24-20-3w5, is drilling 828 feet in the lime at 5,903 feet depth, and making about 50 bbls. a day. It is being deepened for a test of the lower producing horizon of the deep lime in this section of the field.

Model Oils' No. 1, LSD 8, Section 22-20-3w5, has resumed drilling with 1,000 feet of light crude in the hole, after cementing 8-inch casing at 5,235 feet. The crude is coming through a fracture from the Dalhousie sands, about 150 feet lower.

With production figures totaling 478,112 bbls. up to July 31, the Turner Valley Field for the year 1929 has reached a total production close to the figure for

FOR GREATER STRENGTH

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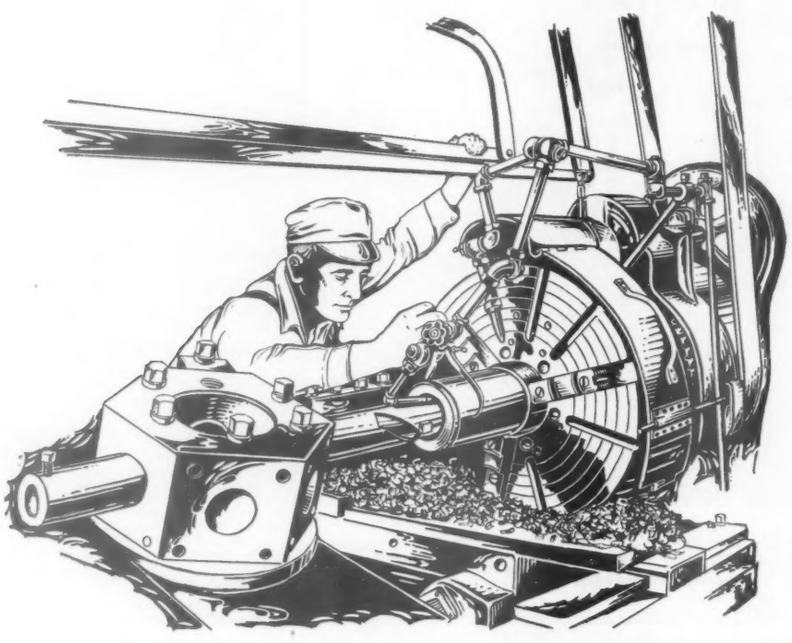
Los Angeles, Calif.



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EMSCO STEEL EQUIPPED WELLS ARE SAFE

This is the fifth of a series of advertisements featuring the Emsco *process of manufacture of Tool Joints*

the entire year 1928, which was 481,357 bbls. With the monthly production around 90,000 bbls. in July, and Home's No. 3 just come into large production, the outlook is that the last five months of the current year will exceed the first seven months, and a production for the year of more than 1,000,000 bbls. may fairly be anticipated.

Syndicate Gets 7,200 Acres

In the southern part of the Highwood area, the South Highwood Syndicate of Calgary has secured 7,200 acres in Townships 13, 14 and 15, Range 2w5. The acreage will probably be developed by eastern interests on a royalty basis. Some 800 acres is in Section 6, 7 and 18, Township 15-2w5, close to Imperial Oil holdings.

In the Skiff Field, the government test of Devenish Petroleum's No. 3, LSD 11, Section 11-5-14w4, is officially reported to show the well capable of producing 36¼ bbls. of 19.2 Baume crude in 24 hours. A detailed report on the well will be made public later. Devenish Petroleums, Ltd., will continue to pump the well for 30 days, after which further plans will be worked out.

On the Montana side, the Monnopeg Oil Co., organized by Winnipeg, Manitoba, interests, is planning to drill 10 wells in the Kevin-Sunburst Field, and has located No. 1 on the Dipple lease. This company also holds acreage on the Flat Coulee structure. Near Cut Bank, Mont., some 40 miles south and east of Cardston, Alberta, Drumheller-Yunck's No. 1 is reported to have encountered oil at 2,685 feet, with a gas flow estimated as high as 12,000,000 feet a day. The location is about 14 miles west of the nearest producer.

In the Medicine Hat Field, the Medicine Hat-Bullivant test has finished in the Medicine Hat sand with a good gas production. The well is being connected with the line and the outfit moved to a new location west of the power house.

To Make Test

Fabyan Petroleums' No. 1, LSD 8, Section 24-45-8w4, has cored 15 feet of oil sand below 2,000 feet depth. The well is reported making 30,000,000 feet of gas, with a potential oil production around 500 feet. Casing will be cemented preparatory to bringing the well into commercial production, when an official capacity test will be made.

A recent survey of drilling operations shows unprecedented activity in the Alberta fields. In Turner Valley alone, there are 84 present or potential oil wells. Some 28 are actually producing either crude oil or crude naphtha. Of the 84 tests, 63 are actually drilling, and 17 other wells are being rigged up, while a number of locations have been made. The Wainwright Field shows 38 wells, of which 7 are producers, four of oil and three of gas. In the foothills belt, Waite Valley and Morley Reserve are the most active areas, while numerous other tests are scattered at various points in the foothills and the border areas.

ROCKY MOUNTAIN AREA

(Continued from Page 57)

Section 30-15-38, Lovington district, had an increase in gas at 2,810-20 feet, total gas being estimated at 12,000,000 feet, and is drilling at 2,950 feet.

In Eddy County interest continues to be centered in the West Maljamar area, northeast of the Artesia Pool, where several wells showing oil are nearing completion. One of these is the Prairie Oil & Gas Co.'s No. 2 Keel, SW cor. Section 7-17-31, which encountered the major break at 3,442 feet and is drilling at 3,447 feet with oil in the hole. Flynn, Welch & Yates' No. 2 Gissler, SE cor. SW Section 12-17-30, one-half of a mile northwest of No. 1 Jackson, the discovery well, is drilling at 3,470 feet and making approximately 120 bbls. of oil per day, the oil coming in heads of 15 to 20 bbls. each at intervals of four to five hours. It has not yet reached the major break in the lime. While it is showing for a better producer than the discovery, it does not have as much gas.

Oil Showing Improves

The Pueblo Oil Co.'s No. 1 Lee, NE cor. Section 34-17-29, has 1,500 feet of oil in the hole, triple the quantity reported last week, and is drilling ahead slowly at 3,100 feet. The same company's No. 4 Russell, NW cor. Section 18-17-31, is drilling at 3,486 feet with a hole full of oil. The Grayburg Oil Co.'s No. 2 Burch, C NW SW Section 19-17-30, has been completed and made 45 bbls. the first 24 hours. The oil tests 36 degrees gravity and is being produced by air lift. Total depth is 3,204 feet. The gas was found at 3,070-90 feet and oil at 3,109-12 and 3,122-26 feet. The elevation is 3,626 feet. Joe Danciger has made a location for No. 1 Turner, NW SW Section 18-17-31. The Continental Oil Co.'s No. 1 Cunningham, NE NE Section 8-20-30, is drilling at 1,880 feet, and the Mesa Oil Co.'s No. 1 Seale, SW cor. Section 12-20-27, is drilling at 1,880 feet. Etz Brothers' No. 1 Etz, C SE SE Section 13-16-30, is drilling at 150 feet.

The Pittsburgh Oil Co.'s No. 1 McAdoo, SW cor. NE Section 16-1s-27, Buffalo Creek, De Baca County, is temporarily abandoned at 4,508 feet.

In Valencia County, the Acme Development Co.'s No. 1 Santa Fe Railway, SW NW Section 27-7n-4w, South Suwanee, is drilling at 3,915 feet with a hole full of water.

UTAH

New tests started in Utah include the St. Thomas Oil Co.'s No. 1, Section 1-14s-9e, in Garley Canyon, in Carbon County, which is drilling at around 500 feet. The surface is the Mancos shale. Standard rig and equipment has been installed. The company is composed of Florence, Colo., men. The Beaver Valley Oil Co.'s No. 2, SW cor. SE Section 19-25-9w, Blackrock Structure, Millard County, is drilling at 185 feet, and H. T. Kaminska's No. 1, SW NE NE Section 30-25-9, in the same district, spudded and shut down.

The Beaver Valley Oil Co.'s No. 1, NW cor. NE Section 20-25-9, is bottomed at 3,465 feet, where it is testing a water shut-off. The water comes from the shale above and a show of oil and gas is reported at the bottom. The Phillips Petroleum Co.'s No. 1 Slick, C NE Section 16-27-16, Barrier Creek structure in Wayne County, is being abandoned at 5,139 feet. It has been troubled with water and was unable to make a shut-off. At 4,840 feet it was reported nearing the bottom of the Hermosa formation of Pennsylvanian age. The Continental Oil Co.'s No. 1 Boundary Butte, Section 22-43-22 San Juan County, is drilling at 5,418 feet. In Washington County, the St. George Oil Co.'s No. 1 Hiatt, NE NW Section 30-43-14, has resumed and is drilling at 878 feet, and its No. 1 Graham, SE SW Section 19-43s-14w, spudded and shut down at a total depth of 931 feet. Both of these wells are on the Beehive Structure.

COLORADO

Location for a new test in the Denver Basin in Eastern Colorado, 75 miles due east of Denver and in Washington County, is announced. M. T. Smith & Sons of Oklahoma City have material on the ground for No. 1 Middlemist, SW SE Section 14-4s-56, on the Middlemist structure in Washington County, at the southern end of the Fort Morgan uplift and 38 miles south of the town of Brush. It is to be a Dakota test, the objective being expected at around 4,500 feet. Donahoe, Stryker & Armstrong, of Tulsa, Okla., also are interested in the deal and these firms and associates have approximately 10,000 acres blocked up.

This structure was mapped about 4 years ago by C. T. Lupton of Denver and subsequently has been checked by several geologists representing the developing and leasing interests. The land originally was brought together into a lease block by business men of Brush operating as the Brush Land & Royalty Co., this concern retaining royalty interests in the acreage. Another new operation is the San-Jo-Ar Development Co.'s No. 1, Section 19-28s-63, in the Aguilar district in Las Animas County, in the southern part of the State. It has the rig up but has not yet commenced spudding.

The Canon City district in Fremont County scored two failures for the Continental Oil Co. Its No. 6 Ben Steinmier, SE SW Section 35-18-70, was dry and abanndoned at 2,490 feet and its No. 1 Smelter, NW NE Section 8-19-70, was abandoned at 3,975 feet. The last named was a wildcat exploring for a possible extension of the producing area on the southwest.

Drilling in Wet Hole

In Arapahoe County, the McDeb Drilling Co.'s No. 1 Fitzsimmons, NE Section 7-4s-66, is drilling at 3,863 feet in a wet hole and lowering the 8¼-inch at 3,837 feet. This size string will be carried until a good foundation upon which to set it to make a shut-off is found. The last 15 feet has shown more colors of oil upon the water.

Nettie M. Slatt's No. 1 Hills, SE cor. Section 27-3s-64, Adams County, is drilling below 475 feet in hard formation containing boulders and progress is slow. A slight show of oil in sand was encountered at around 400 feet.

In Jackson County, the Producers & Refiners Corp.'s No. 1 Hendershot, SE NE Section 2-6n-81, Pole Mountain area, is drilling at 2,329 feet in hard sandy shale, and the Midwest Refining Co.'s No. 21-X Rich, SW NW Section 9-6n-80, Buffalo Creek, is drilling in blue shale at 1,531 feet in a wet hole. The Continental Oil Co.'s operation at Walden is reported shut down pending decision of officials under the reorganization as to the next step.

In Rio Blanco County, the White Eagle Oil & Refining Co.'s No. 1-A Fordham, NW SW Section 9-2s-96, Piceance Creek Dome, is bottomed at 2,270 feet and waiting for cement to harden. The 10-inch was set at this depth. The Texas Production Co.'s No. 1 Potter, C NE SW Section 30-2n-96, White River Structure, is coring at 3,005 feet.

Midwest Straightening Hole

In Routt County, the Midwest Refining Co.'s No. 10 Barmettlor & Clayton, NE NW Section 4-7n-86, Chimney Creek Dome, is drilling on rock and iron at 960 feet to straighten the hole. The Texas Production Co.'s No. 2 State-Lubers, SW SE Section 7-6n-86, Tow Creek, is drilling at 820 feet, and its No. 4 Belle Dennis, NE SE Section 7-6n-86, is bridging hole at 4 335 feet.

Thomas McLaughlin and others' No. 1 Williams, NW SW Section 2-3n-92, Iles Dome in Moffat County, is drilling out cement. The 6¼-inch was cemented at 4.080 feet on top of the Morrison. The McCormick Oil Co's No. 1-A Sales, SE SE Section 28-4n-92, is drilling at 2,960 feet.

The Five Square Oil & Gas Co's No. 1-A State, SW SW Section 16-4n-69, Berthoud Dome in Larimer County, which has been standing with oil in the hole pending completion of deal whereby the Standard Oil Co. of Colorado acquired a half interest in the well, is installing a bradenhead and equipping the well for a test of production. It is estimated that the well will make around 100 bbls. as it stands.

In El Paso County, the Utemoor Syndicate's No. 1 Carson, SW NE NE Section 10-16s-66, Fountain dome, is drilling at 960 feet. The Grand Union Oil Co.'s No. 2 State, NW cor. SW Section 19-17-67, is shut down at 2,763 feet.

MONTANA

The Drumheller well, 10 miles north of Cut Bank, is the most interesting wildcat in Montana at this time, due to a 6,000,000-foot gas flow found in the Sunburst sand last week. At a depth of 2,728 feet a 4,000,000-foot flow was struck and the volume increased as the bit went down. The well was reported spraying about a barrel of oil a day at 2,751 feet. A control head was set last week and the well now is drilling for the Ellis sand which is expected to be found at approximately 2,790 feet. The Drumheller well is located between the Kevin-Sunburst Field and the Rocky Mountains and if commercial will prove up a large stretch of territory. It is about 7 miles southwest of the Sand Point-Berger well which struck an 8,000,000-foot gas flow several months ago but afterwards was drowned out by water.

The Cypress Oil Co.'s test on the Goosebill structure, 45 miles northwest of Fort Benton, has been abandoned at 2,800 feet after finding the contact dry. This well showed gas at 1,050 feet and a little oil at 2,770 feet and these showings are considered good enough to warrant another test of the structure. Location has been made for this second well which will spud this fall.

The United States Petroleum's well on the Black Horse Lake structure near Great Falls is drilling again after shutting off water and at a depth of 1,300 feet reported the sand still showing traces of oil.

The Ohio Oil Co. is down about 3,200 feet in its second well on the Dry Creek structure in southern Montana and has still over 1,000 feet to go to the sand producing gas in well No. 1.

Has Drilled Past Tools

The Potlatch Oil Co.'s deep test in the Kevin-Sunburst Field has succeeded in drilling past the tools after three weeks of fishing and is making hole at about 4,700 feet. This well reported showings of oil at 4,555 feet and at 4,620 feet. A number of gas pockets have been encountered.

The Big West Oil Co. found a 25-bbl. well on the Allen lease in Section 31-35-1, Kevin-Sunburst Field. The Texas Production Co. brought in a well on the Moe lease in Section 28-35-2. Production is coming from the contact at 1,499 feet but the well also showed gas at 1,260 feet. The Radigan-Hungeford interests report a small gas well at 1,200 feet on the Adams lease, the well having been carried to the Ellis and plugged back when the sand was dry. The California Co.'s No. 10 McKee found a 15-bbl. production at 1,477 feet after striking gas in the Sunburst at 1,240 feet. The Deloraine Oil Co. has a Sunburst sand producer in its No. 6 Levnick on Section 28-35-1, making 15 bbls. at 1,295 feet. The L. W. Hill interests which completed two wells in the last few weeks has two more holes going down, while other companies spudding this week are the Sunburst Oil & Refining Co., the Campbell interests, the Texas Pacific and the Dakota-Montana.

The Gas Development Co., a subsidiary of the Minnesota Northern Power Co., has drilled several large gas wells on the Glendive-Baker area and last week completed a well which gauged 26,500,000 feet from a depth of approximately 900 feet. This well is the largest well yet drilled in the Glendive-Baker area.

ROCKY MOUNTAIN FIELDS
Daily Average Pipe Line Runs Week Ending August 24

WYOMING

Salt Creek	33,300
Frannie	30
Big Muddy	2,220
Oregon Basin	5,960
Byron	....
Dutton	30
Elk Basin	800
Ferris	50
Grass Creek	2,240
Greybull	10
Hamilton	1,000
LaBarge	2,290
Lance Creek	200
Lost Soldier	3,990
Osage	640
Poison Spider	1,190
Rock River	2,500
Rex Lake	80
Lander	540
Simpson Ridge	40
Teapot Dome	30
Mule Creek	700
Pilot Butte	190
Total	58,030

MONTANA

Cat Creek	1,420
Kevin-Sunburst	6,940
Pondera	3,030
Lake Basin	90
Total	11,480

COLORADO

Moffat	1,255
Fort Collins	2,390
Florence	910
Iles	1,773
Tow Creek	463
Boulder	25
Rangely	100
Total	6,916

NEW MEXICO

Artesia	842
Cap Rock (Maljamar)	415
Hogback	80
Rattlesnake	1,000
Table Mesa	....
Total	2,337
Grand total	78,763

MIST EXTRACTION

In the separation of oil and gas or gasoline and gas, highly atomized particles of high gravity oil or gasoline remains entrained in the gas after the bulk of separation has been made. The removing of these liquid particles, in the separator is commonly referred to as "Mist Extraction."

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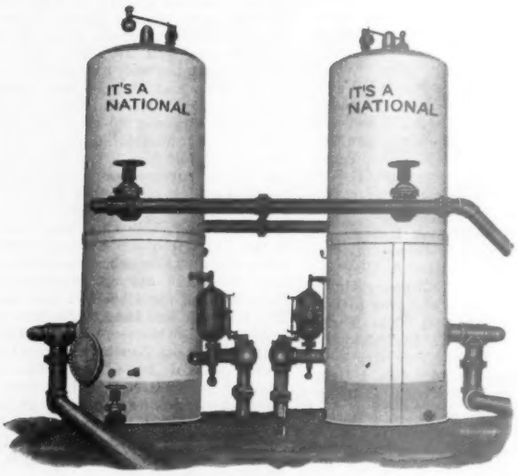
EXTRACTING the GASOLINE CONTENT of the gas going through the separator MEANS INCREASING the GRAVITY of OIL going to the tanks.



No. 2-A Nationals Installed in Tandem
Popular size all purpose separators.

No. 4-A

The No. 4-A National at left operated at 400 pounds back-pressure. It handled 36,000,000 cubic feet of gas, extracting approximately 39,000 gallons of gasoline per 24 hours, leaving only 16/100 gallons of gasoline per 1000 cubic feet in the released gas.

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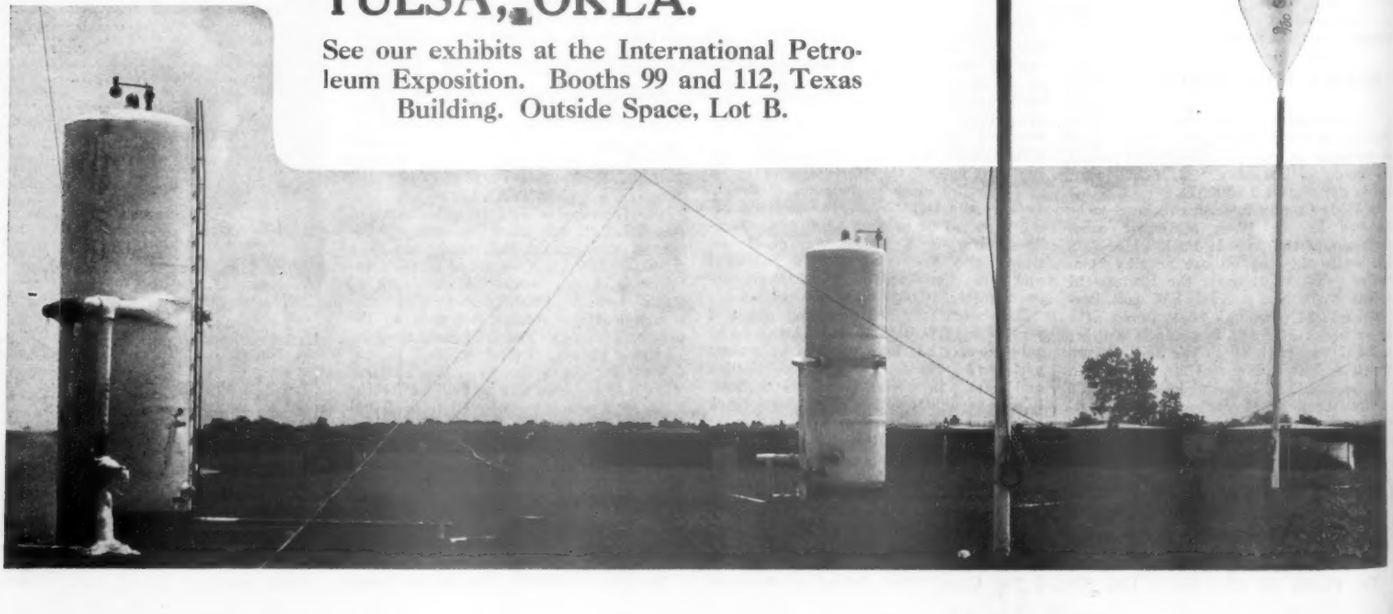


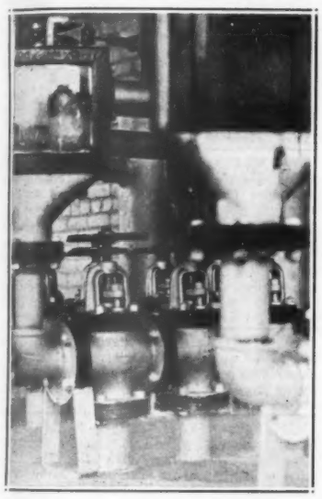
Practical Suggestions in Refining

By W. T. Ziegenhain

Crosshead Valves Make Compact and Efficient Manifold

In the accompanying picture a simple and compact arrangement of manifold piping for a receiving house is shown. After the oil passes through the lookbox it passes down into the series of flanged cross valves bolted together to serve as a pipe when closed. By raising the stem of any one of the valves, the stream is directed into the corresponding tank.

In case any one of the valves need to be replaced or repaired, there are pipe nipples with flanged ends already made up to fit in place of the valve so there is no delay in the operation and the



stream is diverted for a minimum of time. When installing the manifold, the valves were assembled and set in place and in pouring the cement floor, there was enough of an opening left to allow the pipe risers to be adjusted into place. Then cement was filled in around the pipes to make the floor tight and the whole assembly was made sturdy at a very low cost.

The accompanying picture shows an installation in the receiving house of the Producers Oil Co. at Bristow, Okla.

OUTSIDE CORROSION OF TUBES DECREASED

Refiners who are burning acid sludge under boilers and stills have expressed varying ideas regarding the amount of corrosion and the true savings effected in burning this fuel after the higher maintenance costs are paid. In general considerable savings are shown in burning the sludge in addition to the fact, the sludge is objectionable and its disposition desirable. A large share of this excess corrosion has been found to be occurring before the run and that no corrosion is occurring during the operation of the still. This has been thought due to the fact the corrosion on the outside of the tube is due to sulphurous and sulphuric acids. These acids form as the sulphur dioxide fumes, resulting from the burning of sulphurous compounds in the oil, are dissolved in water vapors and moisture on the tubes while raising the temperature in the still. After the temperature reaches the point where no moisture is present, there is no chance for the acid to form and the dry sulphur dioxide gas passes out the stack.

The source of the water has been

(Continued on Page 346)

HYDROGENATION PROCESS PRESENTS WIDE RANGE OF RESEARCH SUBJECTS

The hydrogenation of heavy residuums and other carbonaceous materials to be placed on a large scale operation in the near future by the Standard Oil Co. of New Jersey and subsidiary companies at their refineries in Bayway, N. J., Baton Rouge, La., and Baytown, Tex., has opened a new field for petroleum technology involving even more complicated problems of chemistry, physical chemistry, design and construction than that of cracking. While the application of the principles involved in hydrogenation may not be generally applied in the industry for several years, even if proven commercially feasible, there are many patents being applied for and issued showing the broad interest this work is attracting. In an announcement made by the Standard Oil Co. of New Jersey in June, it was said that company had entered into an agreement with the Farbenindustrie on basic patents and development work regarding the hydrogenation of oil. A plant using the process, referred to often as the Bergius process, has been in operation in Leuna, Germany, for more than two years but uses coal as the basic material. In 1928 more than 300,000 bbls. of motor fuel were made there, showing the process is considerably beyond the preliminary experimental stage. However, recent patents and development work give an insight to the broad field of research being undertaken in perfecting the process.

Hydrogenation or berginisation as it is sometimes referred to, essentially consists of subjecting the material to be treated to temperatures ranging between 850 and 900 degrees Fahrenheit and contacting this material with hydrogen under 150 to 200 atmospheres of pressure. The chief problem has been in finding a catalyst which carries the reaction to the desired end producing a minimum of coke and uncondensable gases.

Choice of Catalyst

Recent work indicates the choice of a catalyst may be made from a large number of metals and their compounds but as may be expected, the choice of the catalyst in commercial application of the process involves its cost of production and this in turn opens up a broad field of chemical research. As was stated before, one of the major problems of hydrogenation is in holding down the formation of coke and uncondensable gases. The choice of the proper catalyst and the exclusion of certain other metals and their compounds which act as undesirable catalysts have much to do with the formation of coke and uncondensable gases. Patents recently issued include the use of alloys of cobalt, molybdenum, tungsten, vanadium or manganese mixed with relatively high percentages of nickle in constructing the reaction chamber and all parts of the plant with which the hot organic materials come in contact.

The walls of the chamber may be made of alloys containing these metals or may be coated with alloys containing them. These tend to drive the reactions in the desired direction but it is stated that the presence of arsenic, antimony, silicon, bismuth, phosphorous or selenium is not detrimental. Copper may be present if there is no trace of sulphur in the chamber.

Separate catalysts, introduced into the reacting chamber continuously with the charging stock, include the oxide and the carbonate of uranium and the metals of the eighth group in the periodic table and their compounds including iron, cobalt, nickle, ruthenium, rhodium, palladium, osmium, iridium and platinum. Obviously, some of these could not be used commercially under the present costly means of recovering them.

Another patent recommends the use of the elements or compounds of the fifth and seventh groups of the periodic table which include, in addition to those already named, nitrogen, phosphorous, vanadium, arsenic, columbium, antimony, tantalum, bismuth, uranium, manganese and the halogens when used in the presence of aluminum or its compounds. Nitrogen is used as ammonium sulphide.

In addition, molybdenum compounds have been found to exert a favorable catalytic action and are said to have the advantage over many other catalysts in that they resist poisoning more strongly than any others known. On the other hand, the use of molybdenum compounds seem to be out of the question considering their present cost of manufacture.

Preparation Important

The kind of catalyst is not the only factor. The manner in which it is prepared is a major factor. Pure nickle precipitated in a very finely divided state is said to give good yields and may be prepared at a relatively low cost. Iron oxide, made into a very fine powder, is also said to be favored as a catalyst in large scale operations.

The pressure at which hydrogenation takes place is also an important factor in the reaction, it being shown that no catalyst is needed when the pressure is increased to 1,000 atmospheres or approximately 15,000 pounds per square inch. At the higher pressures the reaction is carried on more quickly and completely. At 15,000 pounds, the required amount of hydrogen is simply introduced into the reaction chamber where as in the case of the reaction being carried on at materially lower pressures, such as being carried in the commercial processes in operation at present, there must be a constant circulation of hydrogen and a great excess at all times. As in the case of some of the catalysts named, these advantages presented by the use of higher pressures off hand, is thought to be outweighed by the present impracticability of maintaining pressures of more than 2,000 pounds in an apparatus of large capacity such as a commercial operation would be expected to demand.

The cost of manufacturing the hydrogen also stands as a major factor in determining profits from the process. A common source of this hydrogen has been producer gas. The producer gas and steam are passed over a catalyst at a high temperature after which the CO_2 is removed. This leaves a relatively high concentration of hydrogen in the resultant gas.

A complete list of oils including the light gasolines, kerosene, and lubricating oil stocks may be made from the hydrogenation process and because of the high degree of saturation, the products do not present difficult refining problems. How these products will compare from the standpoint of performance with products now made from the ordinary distillation and pressure distillation methods, is not generally known. Prepared from coal, the motor fuel has been readily disposed of in Germany.

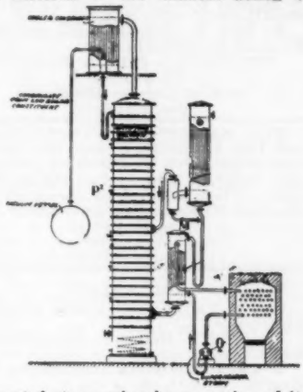
In summary, it is evident, the process is beyond the laboratory stage and with the great amount of research facilities provided by the Standard Oil Co. of New Jersey and the I. G. Farbenindustrie as well as the general interest shown for the problem by France and other European countries which desire to free themselves from depending entirely on imported petroleum products, improvements are sure to be made in the near future. Likewise, what may not appear to be commercially feasible now may be made profitable through quantity production.

Recent Patents

USE STEAM IN TOWER

1,722,322. Continuous Rectification of Liquids at High Boiling Point. Emile Augustin Barbet, Paris, France. Filed June 11, 1923, Serial No. 644,774, and in France Dec. 11, 1922. 1 Claim. (Cl. 196—73.)

Process for the continuous rectification of hydrocarbons and other liquids of high boiling point which comprises subjecting the material to the indirect action of



saturated steam whereby a portion of its constituents is vaporized, subjecting the residual unvaporized liquid material to the indirect action of superheated steam whereby the same is mainly vaporized and bringing the vapors arising in both of the said treatments into intimate contact in a single rectifying column with a reflux of condensates arising from said vapors and withdrawing the condensed material as a plurality of sharply defined fractions boiling within different temperature ranges.

SUCCESSIVELY SUBJECT CONDENSATE TO HIGHER TEMPERATURES

1,724,760. Process and Apparatus for the Cracking of Hydrocarbon Oils. George William Gray, New York, N. Y., assignor, by mesne assignments, to The Texas Company, New York, N. Y., a corporation of Delaware. Filed October 28, 1924. Serial No. 746,298. 6 Claims. (Cl. 196—49.)

1. The process of converting heavy hydrocarbon oils into oils of lower boiling point which comprises subjecting oil to a cracking temperature and pressure in a pressure zone, separating the high boiling fractions of the evolved vapors from the low boiling fractions in the form of a condensate, then subjecting the condensate while still hot to increase cracking temperature and pressure, simultaneously distilling another independent body of oil, separating the evolved vapors according to their boiling points, and commingling the condensate thus formed with the oil in one of the pressure zones.

USE SELENIUM COMPOUND AS CATALYST

1,721,523. Method of Cracking Hydrocarbons. Thomas Midgley, Jr., Dayton, Ohio, assignor, by mesne assignments, to General Motors Corp., Detroit, Mich., a corporation of Delaware. Filed May 5, 1923. Serial No. 636,892. 4 Claims. (Cl. 196-52.)

3. A process of the character described which comprises combining a catalyst of the selenium type with a metal base in proportion to present the catalyst on the surface of the base, and cracking a vaporized hydrocarbon oil by contact with the catalyst.

35 CENTS a line first insertion; 25c a line each additional insertion. Cash in advance.

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EQUIPMENT WANTED

WANTED

Two large Sweetland Filter Presses. Give full details and price. Box D-52, The Oil and Gas Journal, Tulsa, Okla.

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READY FOR IMMEDIATE SHIPMENT
PRICED RIGHT
50 MILES 4" O.D. PLAIN END PIPE
11 MILES 12" O.D. PLAIN END PIPE
15 MILES 4" STD. SCREW PIPE
60 MILES 2" STD. SCREW PIPE
All sizes in casing and line pipe from 2" to 15½" inclusive.
PRODUCERS PIPE & SUPPLY COMPANY
612-13 Kennedy Building
Tulsa, Oklahoma

FOR SALE—One Turnbuckle Standard Rig, 5-inch irons, steel bull wheels, steel band wheel, steel walking beam, 45 H.P. boiler, 11½ by 12 Ajax engine. Complete string tools. Two thousand feet 6⅝-inch, 20-pound California casing new.
Wm. H. Cater.
2643 Monroe Street,
Chicago, Illinois.

FOR SALE
3—100 ton Ball Horizontal Ammonia Compressors.
1—160 HP Rathbun Jones Vertical Gas Engine.
1—200 HP Western Twin Duplex Gas Engine.
All in first class condition. Will sacrifice at a few cents on the dollar. E. S. Calvert, Phone 2-4372. P. O. Box 1441, Tulsa, Okla.

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2,000'—12½" Csg.	5,000'—8" Line Pipe
2,000'—15½" Csg.	

For immediate shipment from our Texas yards.
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Wichita Falls, Holliday, Vernon, Breckenridge, Pampa, Texas.
EASTERN HEADQUARTERS
Butler, Penna.
KEYSTONE PIPE & SUPPLY COMPANY
Holmes Building
Fort Worth, Texas.

TIMBERS
8x12, 8x14, 8x16—22 feet and longer
$37.50 per thousand
HIGH GRADE
3x6 and 3x8 D & M
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ALL MATERIAL
No. 1 Long Leaf Yellow Pine
Out of 9-Story Mill Const. Bldg.
BETTER THAN NEW
Price quoted f.o.b. Kansas City, Mo.
KING LUMBER COMPANY
1725 TROOST AVE.
KANSAS CITY, MISSOURI

STANDARD TEMPER SCREWS 50 per cent regular price to reduce excess stock. United Iron Works, Inc., Hunt Bldg., Tulsa, Okla. Phone 4-9181.

FOR SALE—Complete set Standard Tools, 12x12 AJAX engine (NEW), 2,000 ft. 6⅝--inch, 24-pound, 700 ft. 10-inch, 52-pound, 1,500 ft. 2-inch pipe. F. E. Turner, 217½ Broadway, Muskogee, Okla.

FOR SALE. Second hand gas engines.
100 HP Bruce MacBeth Gas Engines.
70 HP Bruce MacBeth Gas Engines.
50 HP Superior Gas Engines.
100 HP F & M Oil Engines.
All in first class condition, priced right.
H. F. Quinlan, 203 Wright Bldg.,
Tulsa, Oklahoma. Phone 2-2802

Number 28 STAR DRILLING rig complete from 10" to 4⅞". Also one string 12½" tools complete. Located 2½ miles of Benedict, Kansas. If interested write Benedict State Bank, Benedict, Kansas.

FOR SALE—EQUIPMENT

WE HAVE AVAILABLE for early shipment subject to prior sale the following used supplies at Stockport, Ohio.
10,000 feet 6¼-inch 13-pound casing in No. 1 condition.
15,000 feet 5-inch casing in No. 1 condition.
5,000 feet 5⅝-inch casing in No. 1 condition.
50,000 feet 2-inch line pipe.
10-15 hp. Reid Gas Engines with single or double Eccentric Pumping Powers.
Two 120 hp. Miller Direct Driven Compressors complete with Electric Generators, Air Starters and Compressor Houses.
Two 95 hp., same.
Write or wire for prices.
H. B. Walker, Trustee
W. F. Glass & Co.
Stockport, Ohio

FOR SALE—One light Sanderson-Cyclone oil rig tractions. Type good for 900 feet. A. D. Fasnacht, R.F.D. No. 4, Massillon, Ohio.

FOR SALE OR TRADE. One standard drill rig equipment. Tools good. Also about 1,800 ft. of 6⅝ in. casing and some 12 in. Address E. L. Mayes, 1½ North Main Street, Fort Scott, Kansas.

BUSINESS OPPORTUNITIES

YOU can make BIG money helping to develop the gold mining industry of Colombia, South America. For particulars address Davidson, 201 First National Bank, Denver, Colo.

WILL SELL A FEW interests in 230 acres and drill well. Adjoining lease well estimated 300 bbls., 42 gravity at 1,200 feet. P. O. Box 183, San Antonio, Texas.

OVER 2,500 ACRES under lease. We drill and repay investment out of pipe line runs; investor still retaining his original interest. Production to substantiate our proposition. H. H. Francis, 714½ Francis St., Saint Joseph, Missouri.

FOR SALE, half interest in 8,000 acre block and completed well for $45,000.00. Test four sands above 1,800 feet pay one-third cash, balance out of oil R. Kamon, 1514 W. T. Waggoner Bldg., Fort Worth, Texas.

WANTED

WANTED. One 1,500 lb. steam hammer, and Blacksmith equipment. R. E. Youker, Hutchinson, Kansas.

MAN WITH STANDARD RIG to drill on three blocks of leases consisting of 15,000 acres near good productioin in Illinois on royalty basis. This location has a real showing of being an oil field. Has rock and coal outcropping together with oil and gas seepage. Come look this over. Virgie Cox, Patoka, Illinois.

WANTED. DRILLING CONTRACTOR to drill well in Blanco County, Texas, to 1,500 feet or paying production for part cash and part payment in acreage; turn key job; good prospect, but strictly wildcat. H. J. Behning, Box 917, San Angelo, Texas.

SHALLOW PRODUCTION WANTED. Must have drilling possibilities. State full details and lowest prices in first letter. Write Box D-104, The Oil and Gas Journal, Tulsa, Oklahoma.

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ADDRESSES WANTED

WANTED INFORMATION as to the whereabouts of Ralph Jones, working in Oklahoma or Texas oil fields. Very important. Write Box D-91, The Oil and Gas Journal, Tulsa, Okla. Liberal reward.

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OIL LOCATED before drilling. Geophysical method. Toggodometer Instrument; take pay in oil. No oil, no pay. Except traveling and testing expenses. 95 per cent accuracy. O. P. Coffin, Caddo, Tex.

OUR EUROPEAN OIL FINDER is available for making drilling locations. The manufacturer of this instrument guarantees successful drilling locations. D. C. Oliphant, 19 West 44th Street, New York.

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Norman, Okla.

POSITION WANTED

CONSTRUCTION ENGINEER with 16 years experience with major companies in refinery, pipe line, gas compressor station and other petroleum industry construction work in responsible positions desires connection with growing concern. Engaged at present and is good organizer and executive who can get results. Can handle any size job. Reply care Box D-31, The Oil and Gas Journal.

GRADUATE GEOLOGIST, age 24, unmarried, desires position. Prefer subsurface department. Willing to accept small salary to start. Best references. Available at once. Write Box D-70, The Oil and Gas Journal, Tulsa, Okla.

SALES ENGINEER and construction superintendent, 12 years' experience in steel storage tanks, refinery and water service equipment. Good acquaintance in Mid-Continent district and Eastern territory. Desires connection with live concern handling oil field equipment. Can produce the goods. Box D-93, The Oil and Gas Journal, Tulsa, Okla.

SINGLE MAN desires position where knowledge of oil geology would be advantageous to employer. Inquire Box D-92, The Oil and Gas Journal, Tulsa, Okla.

PRODUCTION EXECUTIVE AVAILABLE. Widely experienced in various fields of the United States. Thoroughly experienced in modern methods and equipment. Capable of taking complete supervision of drilling and operating. Deep or shallow wells; rotary or cable tools. Well educated and untiring worker. Excellent references. Address Box D-95, The Oil and Gas Journal, Tulsa, Okla.

GRADUATE CHEMIST wishes a position as assistant chemist in Petroleum refinery. A. B. degree and one year post graduate work in oil and metallurgy. Five years experience in chemistry of food. Best of references. H. L. Shirk, 223 Huntoon, Topeka, Kansas.

ENGINEER, 33, WITH 10 YEARS OIL EXPERIENCE ABROAD, 4 years as chief engineer, thoroughly familiar with oilfield engineering, desires progressive post. Write Box No. D-102, The Oil and Gas Journal, Tulsa, Oklahoma.

CIVIL ENGINEER, age 24, single, six years experience in land surveying, pipe line location, and construction work desires position as party chief or instrument man. Excellent references. J. T. Riley, Jr., 403 West Nash Avenue, Terrell, Tex.

CIVIL ENGINEER
Familiar with production and pipe line engineering, fifteen years experience, permanent position wanted where experience and ability is needed. Box D-108, The Oil and Gas Journal, Tulsa, Oklahoma.

EIGHT YEARS' experience as a stationary gas engine operator, repairman or trouble shooter. Foxboro meter repair man. In charge gas air lift plant the past two years for one company. Desire change. References. Box D-98, The Oil and Gas Journal, Tulsa, Okla.

COMPTROLLER-AUDITOR. Now available, having just terminated position held eight years with large oil company having many subsidiaries. Experienced in all phases of accounting, financial statements, and Federal Taxes. Write Box D-106, The Oil and Gas Journal, Tulsa, Oklahoma.

POSITION WANTED

A-1 OIL ACCOUNTANT, 15 years experience including 5 years Public Practice. Experienced in Refinery, Production, Pipe Lines, and Materials. Capable of assuming charge of office or Accounting Department. Pleasant personality. Married. 35 years of age. Employed at present. Can furnish best of references, also bond. Address Box D-107, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

DRAFTSMAN capable of handling design as well as detail work. Familiar with refinery and general oil field drafting. Experience and sample of work to accompany application. Chief Engineer, Empire Companies, Bartlesville, Okla.

WANTED—Natural Gas Engineer and Executive. Must have practical experience in construction of main line and distributing systems, ability to make gas sales and purchases and thorough knowledge of general executive work. Give full details of previous employment, number of years and salary desired. Address Box No. D-75, The Oil and Gas Journal, Tulsa, Okla.

WANTED: HIGHLY CAPABLE SALESMAN familiar with oil and gas pipe line practise, to sell high class line of equipment. Must have reasonable mechanical ability and willingness to work hard and travel large portion of time. Reasonable salary and expense at first with splendid opportunity for early advancement. Must be sober and give best of references. Address reply to D-78, The Oil and Gas Journal, Tulsa, Oklahoma.

COMPETENT refrigeration engineer by Mid-Continent refinery. State age, experience, extent of education, etc., in letter to Box D-94, The Oil and Gas Journal, Tulsa, Okla.

CHIEF CHEMIST WANTED for large independent oil company. Must be thoroughly familiar with the manufacture of Lubricating oils from Mid-Continent Crude Oil. Will have charge of a number of Refinery and Blending Plant Laboratories. In application give education, experience, age, and salary expected. Box D-80, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED PUMP SALES ENGINEER. State salary expected to start, age, married or single, and detailed statement of experience together with names of employers. Address Box D-100, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL WANTED. To finance new well on my 1,500 acre leases. Been down 1,105 feet. Fine indications for oil at 1,400 feet. Will give good interest to party financing, or party with rotary machine. A. E. Johnson, Box 87, Polk, Nebraska.

WANTED—EXPERIENCED PUMP SALES ENGINEER with knowledge of refinery and pipe line applications. Young married man already acquainted with trade in Oklahoma and Texas. Must have engineering education, good sales record and free to travel territory. In applying give full details, salary, when available, and photo, if convenient. Write Box No. D-101, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED. SUPERINTENDENT for gas system. New company desires man to take charge of gas distribution system in North Texas. System will cover ten or twelve towns and about 200 miles of pipe line now under construction. State reference, experience, age, and salary expected. Address 607 Holmes Building, Fort Worth, Texas.

WANTED: A HIGH CLASS WAREHOUSE FOREMAN for a 10,000 barrel refinery. Must be experienced at this kind of work and be familiar with refinery supplies. Send full details, salary expected and picture in first letter. Box D-105, The Oil and Gas Journal, Tulsa, Oklahoma.

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164,000 ACRE West Texas ranch unimproved. Other smaller tracts priced for quick sale. W. E. Wheat, Box 483, Alpine, Texas.

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LEASES—PRODUCTION

S.E. OKLAHOMA absolute title land bargains, 40 to 1,000-acre tracts of coal in new oil and gas field; $5 an acre up. John Cavanagh McAlester, Okla.

CONFIDENTIAL reports on drilling wells, lease values, drilling costs, records, concerns and individuals in Pecos and adjoining counties for $1.00. Box 451, Fort Stockton, Texas.

LEASES AND ROYALTIES for sale. Drilling Blocks given for wells. O. O. Milliken. Box 63 Oklahoma City, Okla.

FOR SALE—2,000-acre lease with good "sweet" gas well. Panhandle Field, Texas. M.E.B., care The Oil and Gas Journal, Tulsa, Okla.

40 ACRES new 10 yr. leases on Government Structure in Texas $10. Good as Mexia or Powell. Oldtimer, Box 1803, Ft. Worth, Texas.

WHY NOT BUY leases near active drilling well almost within shadow of big 112 foot derrick $5 per acre within mile at $2 to $3 per acre, along major fault being heavily played by big producers? Actual development is what makes values! Get close in. 100 free plats on hand. We are actual developers, own our own rig and equipment, spend most our time in the field with our boots on. W. J. Dobbs, 703 Dallas Natl. Bank Bldg., Dallas, Tex.

GRAY CO., TEXAS, lease in proven territory. SE 20 acres of N½ of Sec. 1, B&B. Apply to E. Kev, Marshall, Tex.

PRESIDIO COUNTY, TEXAS

The Texas Pacific Coal & Oil Co.'s well, Section 83, Block 8, now spudded and drilling ahead. Test reported to go 4,000 feet if necessary.

You are now offered at $35 each a 6-acre perpetual oil and mineral deed, 1 acre each tract, and spread over six tracts containing about 2,880 acres.

The description—all sections or tracts —1-2-27-28-30, Block 8; 3, Block 7. All solid.

To purchasers: You get recordable royalty deed, abstractor certificate title and Presidio County map.

Presidio County should get a big play. That means advance in prices.

If interested, address Atlas Royalty Co., Box 762, San Angelo, Tex.

DRILLING BLOCKS in Bell County, Texas, along the fault zone. Faults upon which to base geology. A. L. Monteith, Belton, Tex.

BUILDING CONTRACTORS AND OPERATORS. Will give 30,000-acre lease for a 4,000-foot hole. D. C. Oliphant, 19 West 44th St., New York.

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FOR SALE 2,000 acres blocked Virgin territory. 6 miles from Ashland, Ohio. An oil seepage on block of many years standing, when agitated does not break up. Ashland and adjoining Counties, best Clinton sand gas and best Berea sand oil territory in State of Ohio. Will stand closest investigation. Inquire of James Tallon, Cottage St., Ashland, Ohio.

I have a rig and casing and leases on acreage in Wichita territory. Want party to drill well or furnish money for drilling for an interest. Address, Lease Owner, 4168 Eaton, Kansas City, Kansas.

NOTICE. I have eight hundred acres located in Elk Co, Kansas, Sec. 19-20-30, Twp. 13, close to production, never been drilled, that I wish to lease to someone who will start drilling at once. It will pay you to investigate this, as this was never advertised before. Wire or write L. M. Benefiel, Paola, Kansas.

FOR LEASE. 150 acres, section 23-24-25, Bryan County, Twp. 6, Range 7, Mead, Oklahoma. A. Dvorak, 2102 West 19th Street, Chicago, Ill.

4,000 acres in leases given free for the drilling of one well 2,000 feet; old shallow gas territory; good market. Linn County, H. W. Mitchell, Parker, Kansas.

NEW MEXICO OIL LEASES

If you are really interested in cheap leases write me for maps and prices. Here is a real opportunity for brokers, speculators and investors.

Frank Strickland
Sapulpa, Okla.

LEASES—PRODUCTION

FOR LEASE, Oil and Gas acreage in Section 16-17-19 and 20-12-11, also in Sec. 21-12-9, Okfuskee Co., Okla. Address Box C-961, The Oil and Gas Journal, Tulsa, Okla.

IF INTERESTED in Michigan oil fields, leases or production, write Michigan Oil and Mining News, 115 Ionia Street, Grand Rapids, Michigan.

LAND, Leases, Royalties and Drilling Blocks in proven or unproven territories, Winkler, Pecos, Ward, Loving, Reeves, Culberson and adjoining counties. Wire or write.

H. F. Anthony, Anthony Bldg., Pecos, Texas.

INEXHAUSTIBLE gas wells at 300 feet, 1,500-acre block in Southeast Kansas, close to good industrial year-around market at 10 cents. Five gas strata 165 to 850 feet, gas production on all sides, no line pressure to buck. Long life sand gas and practically no decline to shale gas. Almost impossible to drill a dry hole. Block is for sale reasonable. Address P.O. Box 533, Bartlesville, Okla.

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THE OIL AND GAS JOURNAL

Tulsa, Oklahoma

LEASES and royalties, Caddo, Blaine and adjoining counties. Write for complete list. A. E. Baldwin, Anadarko, Okla.

ACREAGE ON THREE structures now producing from shallow sands to let to well financed company or individual for overriding one-eighth without cash payment or for overriding one-sixteenth and $10 per acre. Balcones fault zone within 30 miles of San Antonio, 3,000 acres, 750 acres and 700 acres. Frontier Oil Co., San Antonio, Tex.

LEASES—PRODUCTION

800-ACRE LEASE, Miami County, Kansas. Proven territory. Have rig but need money. 35 gravity oil. Your money back from first production, then 50-50. A. W. Johnson, 513 Hall Bldg, Kansas City, Mo.

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WE PAY CASH for Lea County oil leases. FOR SALE: Lea County perpetual deeded oil royalty under major company leases. Southeast New Mexico oil leases, $25 for 40 acres. Low rentals. Easy payments. Chance for huge profits. Write Monarch Investment Co., Roswell, N. Mex.

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CHARTERS—Delaware best, quickest, cheapest, most liberal. Free forms. Colonial Charter Co., Wilmington, Del.

DELAWARE incorporator. Charters, fees small, forms. Charles G. Guyer, 901 Market St., Wilmington, Del.

Brokers in Oil and Gas lands.
Big acreage a specialty.
We have under lease several thousand acres at present in proven territory. Roark Service Company, Cecil E. Roark, Manager. Greenville, Kentucky.

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CAPITAL — An experienced, dependable broker will aid in financing propositions of merit. Amster Leonard, East Orange, N. J.

CORPORATE ORGANIZING and promoting of meritorious enterprises, reorganizations and new financing.
The Brookworth Co., Inc.
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New York, N. Y.

DO YOU NEED MONEY for organizing or financing oil or mining deals? Write 2443 N. W. 12th, Oklahoma City.

FINANCE YOUR OWN project with shares bonded. Quickest, most satisfactory known method of raising capital. Information free. Bankers Interstate Security, Electric Bldg., Denver, Colo.

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TULSA, OKLA.

ROYALTIES—PRODUCTION

SEDGWICK, Harvey County, Kansas, Royalties on core drilled blocks, offsetting drilling wells and locations, also Ness County leases and royalties. James R. Haynes, Grantville, Kansas.

YATES POOL ROYALTY

WILL sell 1 acre or more Sections 10 and 19, Blk. 194, Pecos County at $250.00 per acre. Glen Myers, San Angelo, Texas.

ACTIVE WEST TEXAS ROYALTIES $8 square mile. Big company operation. See maps and bulletins. R. R. Fisk, Box 1214-B, Wichita Falls, Texas.

J. A. WOLF & COMPANY
127 N. Dearborn, Chicago, Illinois.
We deal in Oklahoma Royalties exclusively.

ROYALTY and Leases in Western Oklahoma and Southwestern Kansas for sale at low prices. Sain & Company, Forgan, Okla.

FOR SALE—Oil and gas lease, with or without royalty, located in Chautauqua County, Kansas, Section 20-32-13, Northeast corner. Inquire E. A. Volk, 118 Herkimer Street, Buffalo, New York.

WALLER COUNTY, TEXAS, ROYALTY, adjoining TEXAS CO. lease and eight miles from HUMBLE OIL Co. production. Get full details. Lester Barry, 4117 Enright Ave., St. Louis, Mo.

WILL BUY oil royalties.
James H. Dugan,
El Dorado, Ark.

BROKERS AND OIL companies attention. For cheap leases, royalties, mineral rights and drilling blocks in Bexar and adjacent counties, write to P.O. Box 867, San Antonio, Tex.

ARKANSAS ROYALTIES and leases in Van Buren and Conway Counties for sale. Very active. W. F. Bridewell & Co., Box 1125, Little Rock, Ark.

PRESIDIO COUNTY, TEXAS

The Texas Pacific Coal & Oil Co.'s well, Section 83, Block 8, now spudded and drilling ahead. Test reported to go 4,000 feet if necessary.

ROYALTY FOR SALE

You are now offered at $45 each a 6-acre perpetual oil and mineral deed, 1 acre each tract, and spread over six tracts containing about 2,880 acres.

The description—all sections or tracts —1-2-27-28-30, Block 8; 3, Block 7. All solid.

To purchasers: You get recordable royalty deed, abstractor certificate title and Presidio County map.

Presidio County should get a big play. That means advance in prices.

If interested, address Atlas Royalty Co., Box 762, San Angelo, Tex.

BANKERS-BUSINESS MEN: Have shallow gas acreage several productive shales and sands 190 to 750 feet. Profitable market all we can develop cheap drilling. Write for details. Box D-103, The Oil and Gas Journal, Tulsa, Okla.

AUTOMOBILES

1928 LINCOLN five-passenger Sedan, brand new, never in service. Attractively priced. V. C. Henderson, Box No. 1533, Des Moines, Iowa.

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Before disclosing your invention to anyone, send for blank form,
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FOR SALE — Patent rights for new cable tool underreamer. A. C. Byers, 9400 S. Vermont St., Los Angeles, Calif.

Chicago's Gasoline Demand Is Lively

Delightful Touring Weather Has Marked Effect on Consumption. Contract Buying Continues, With Fair Spot Business

By J. B. Waldo

CHICAGO, Aug. 26.—Continuance of delightful touring weather over the week end had its effect on the gasoline demand as shown by the orders received today. The buying on contracts continued to be large and there was a fair run of spot business. Refiners here reported that their shipments were heavy and they were a few days behind on many orders. Several have leased additional cars in order to keep up their deliveries. The price situation was unchanged as to the major refiners who were all quoting 7¾ cents. There was an upward tendency in the spot market where the prevailing price for U. S. Motor was not below 7½ cents with many quotations made at 7⅝ cents. Refiners are decreasing their gasoline stocks and one of the large organizations asserts that with a continuance of the present rate of demand it will be at the bottom of the tanks by the middle of September.

There has been talk of an advance in the price of U. S. Motor gasoline to 8 cents Group 3 and there was more of this today, but none of the major refiners had made the move. Some of the active men in the sales end said that while the amount of orders booked and the condition of their stocks would have justified them in making the increase they did not feel sure that they would be able to maintain it.

Kerosene was moved steadily at 5½ cents and several sellers stated that they would have to increase their quotations when present supplies were sold up. The movement in furnace oils was light today, partly owing to the continued hot weather. Prices were firmly held and the offerings by refiners limited and for the most part held at prices above the recent market.

Industrial fuel oil was inquired for by about the usual number of monthly buyers. The quantities asked for did not show any increase. Prices are firm and several refiners advanced their price during the last day or so 2½ cents a barrel on the heavy gravities. Next Monday will be Labor Day, always a day of large gasoline consumption, and the refinery demand for gasoline should reflect this consumption to some extent all of the week.

Market Reflects Consumption

The refinery gasoline market at the present time is reflecting more closely the actual consumption than at any previous time this year. Early purchases were large, but much of the gasoline bought in April, May and even in June did not go at once into consumption. It was added to the jobbers' stocks. The heavy consumption which began with the touring season was supplied in part by drawing on these stocks and it was not until the latter part of July that the sales by refiners to jobbers truly reflected the actual consumption. Just so long as the consumption is so large, the demand will be heavy on the refiners.

The last 60 days have had exceptionally favorable gasoline weather for daily use of the automobile. One good indication of this is the light traffic on suburban passenger trains. The popular trains arriving in the city from suburbs between 8 and 9 o'clock in the morning when the passenger traffic on these lines is usually at its peak, are now running half filled instead of to capacity, as is the case during the seasons when traffic is more normal.

The gasoline demand in this market last week was large. Most of the business was done with contract customers and on contracts there was a fair amount of spot buying. The sales manager of a large refining organization said that his spot business was very light for the reason that all the legitimate jobbers were under contract and the only spot buyers were the cut price dealers. Another sales manager in explaining the light spot business done by his office stated that his company had bought out all of his spot customers and he had no one left to sell to. These statements explain in a degree why a good spot buyer is fairly bombarded with long distance telephone calls and wires by those having gasoline or other products which they would like to sell. One of these large spot buyers said recently that on many days the number of long distance calls was so great that in order to get the time to attend to his business he had to instruct his switchboard operator to tell the local telephone office that he would be out of the office for the day and to refuse to put through the call.

Market Firm

The market was firm all of the week and the range of quotations quite narrow. The major refiners held their price to 7¾ cents for U. S. Motor gasoline, Group 3 basis, and the price at which the bulk of the material was sold by other concerns was 7½ cents. Early in the week some quotations were made of 7⅝ cents for full U. S. Motor gasoline but this price as well as lower prices for less desirable material disappeared later in the week and some of the independent sellers quoted 7½ to 7⅝ cents. There was little resistance made to the advance in price by jobbers, many expressing themselves as pleased at the stronger market for several reasons, one being that it would remove the danger of a complete unsettling of the price structure in this territory by a tank wagon decline. Not a few also agreed that the refiners were entitled to a higher price. The absence of that extreme pressure to sell that has been so evident in this market all the season was very generally welcomed as permitting a stable market.

Advertising Sells

The demand continues to be for the U. S. Motor grade and for the antiknock gasolines. Some of these latter are evidently favored by the motoring public largely on account of extensive publicity. The efficiency of this kind of publicity is evidenced by the experience of some jobbers and the wide demand for a certain nationally advertised antiknock motor fuel. One well-known jobber stated that when he substituted this brand for another at his stations all of them increased their sales and several of them were now selling regularly three times as much of this make of antiknock gasoline as they had formerly sold of another product well known in the industry but not to the motoring public. The demand for the higher gravities has continued to drag and prices are only steady through sympathy with the U. S. Motor grade. Conditions in the eastern part of the territory show no improvement. The city of Detroit bought its latest order of gasoline last week at 10 cents delivered at Detroit. The refiners in northern Ohio and in Detroit are pushing for business in the eastern part of this territory through Indiana and even northeastern Illinois. They are using their freight differentials to the full and competing with the refineries at East Chicago and Whiting for this business. Some of the larger refiners located outside of this territory frankly admit that the northeastern parts of the Indiana territory are lost to them. The advantage of the short haul for their products, enjoyed by the nearby refineries, gives them too great an advantage.

Kerosene Active

Kerosene had quite a spurt of business last week and the refiners quite generally have advanced their prices, some to 5½ and others to 5¾ cents. The demand was more general than it has been, practically all of the refiners as well as the marketers reporting considerable business for this material. Kerosene is available at 6¼ cents Toledo and some considerable sales are reported, Toledo shipments having an advantage of around 2 cents over Group 3, according to destination. Of course these shipments are only possible within a certain distance for the rate is a local rate and will soon equal the through rate from Group 3.

Furnace Oil

The furnace oil business has shown little life as yet. A spell of cooler weather last week caused some distributors to order out a few cars but there was no general movement and the warmer weather at the close of the week checked what little movement there was. It is too early for the average distributor to take in any real quantity. Some of the larger distributors here and outside of the city have been buying from time to time when they could pick up the kind of distillate or gas oil that they wanted at a price that was attractive. Dealers in this city have begun to consider the possibilities of the development of the plans of the gas company to supply gas for heating on a very large scale. It was developed last week that it was a subsidiary of the local gas company that bought the old Inter-Ocean refinery site at McCook and that

Distillate and Gas Oil

Both distillate and zero gas oil are hard to buy right now for spot shipment except at prices considerably higher than the spot market price which at present reflects buyers' rather than sellers' ideas. With an increased demand the views of the seller are liable to be more important. Fuel oil dealers complain of the difficulty in securing definite prices or agreements from their former sources of supply. Some refiners state that they will not be ready to quote prices and in fact will not know how much furnace oil they will have to sell until later in the year, after the gasoline rush is over. Most of the contracts made with distributors merely provide for a certain quantity to be taken over the season between September and May 1 at the prevailing price in the general market at the date of shipment. Most of these contracts have a maximum and no minimum. One of the larger refiners has made some contracts naming a price of 3¾ cents for 37-40 amber distillate over the season but quit making them after a brief period and is not contracting for anything right now. One refiner is asking his trade 3¾ for a 38-40 straw, and 3½ cents for a 36-38 amber distillate. The zero gas oil market is in much the same position.

Gas Oil

Gas makers' oil or straightrun gas oil, the principal demand for which is now from the gas companies, is firm though not active. Many of the gas company buyers state that they are either being supplied on contracts or have bought for their future needs for a period and cannot in either case take in any more oil.

Fuel Oils

The supply of industrial or heavy fuel oils has been decreased by the condition of the West Texas plants, some of which are running one-half capacity and others not at all. The action of the Shell Petroleum Corp. in practically withdrawing all fuel oils of 24-26 gravity and lower from the market has also diminished the local supply materially. Fuel oil dealers and consumers forced to seek new sources of supply have found that the refiners are very firm in their views and as the supply of earlier purchased oil is consumed gradually higher prices are being paid for all of the heavy gravities with the sole exception of the very heavy grades which are in limited demand owing to the kind of equipment necessary for their easy burning. One of the refiners who has been asking 57½ cents for 18-22 fuel oil with a guaranteed cold test of 30 degrees, has very lately made some sales at that price which is the high of the market at present with the low at a possible 52½ cents, depending on the quality of the oil and to some extent on the buyer. The higher gravities from 26-30 and upwards are scarce and hard to buy. One leading industrial concern bought 50 cars of 26-30 gravity oil for delivery over the next 90 days and paid 75 cents for the material. This buyer does not specify the viscosity or sulphur content but sellers know the kind of oil that he wants and ship him that kind. The demand is not active but there is business to be had. Some report an increase in the inquiries for September. After the early part of September the industries will be increasing their activities and will require more fuel oil. In another month the consumption will be increased by the demand for heating, for even if the weather is seasonably warm many will fill their tanks to be ready for any demand for heat that may come. The hotels, apartment houses and the large office buildings are expected to supply heat after that date when required. One of the advantages in using fuel oil is that steam can be so quickly supplied with oil heat that it is unnecessary to carry a small fire all of the time as with coal. So long as the supply of oil continues to be restricted the market will be firm but any material increase in the offerings might bring an easier market. Some of the fuel oil men believe that with the first cold weather the holders of fuel oil will all seek a market and prices may ease off as a result. The industrial outlook continues good for the fall season. several important industries stating that recent orders have assured them a large output for at least the next three months.

Lub Oils

Lubricating oils are generally firm although steam refined stocks and neutrals are a little easier in tone. Mid-Continent bright stocks continue firm with a large demand in sight as many compounders have used the entire amount of their contract and are now in the market for additional supplies. Refiners state that if there is any product regarding which they have no cause for present worry, it is bright stocks. The demand for motor oils is fair, not quite as active several have stated as in July which was a very good month, better with most than June. The industrial demand is improving right now but has been good so far this season.

OUTSIDE CORROSION OF TUBES DECREASED

(Continued from Page 343)

traced to condensation of moisture on the tubes due to the introduction of steam with the fuel for atomizing, as the cold oil is run through the still at the start of the run. In recognition of this, refiners have decreased this corrosion materially, by starting to run, using some other fuel, such as gas or a low sulphur fuel oil and then "cutting in" the sludge fuel after the temperature under the boiler or still has become higher than that permitting the presence of moisture.

Eastern Gasoline Markets Unsettled

Notwithstanding Unfavorable Features, Large Refining and Distributing Company See One of Best Years in History

By A. E. Mockler
New York Bureau, The Oil and Gas Journal

NEW YORK, Aug. 26.—Gasoline market conditions remain unsettled throughout the entire East Coast area. There have been no further developments of importance, although price cutting continues general with the established market of 10 cents per gallon for U. S. Motor shaded by a full cent in some instances.

In the lubricating oil group, cylinder oils have eased off, failing to hold at the higher levels reached last week. Volume of trading in cylinder stocks, however, has picked up and the market is in much better position than was the case a month ago.

The only other change of moment during the week has been a slight firming up in fully refined grades of paraffin wax, under better buying.

Notwithstanding the position of the gasoline market, from the price standpoint, it is evident that the large refining and marketing companies in the East Coast area will have one of the best years in history, from the standpoint of volume and profit. While the competitive situation and the outlook for the immediate future could be much brighter, leading interests here express optimistic views. The several new entries into the eastern marketing field will have been thoroughly absorbed by the end of the year, it is pointed out, and the accompanying readjustments in the marketing picture accomplished. Then, too, it is felt, the problem created by heavy overproduction of crude oil will probably come in for a definite solution before 1930 gets under way.

Tank Car Gasoline

The market is still in an unsettled position, and the undertone is definitely easy. The "official" 10 cents quotation is a thing of the past, in so far as actual sales are concerned. It does not appear, however, that the large sellers are going under 9½ cents in the open market on the average run of business. As one of the largest factors in the East Coast market put it, "We will go to 9½ cents to meet competition, but if we can't get the order at that figure we are willing to lose the business."

Gallonage throughout the entire East Coast area is materially in excess of that of a year ago at this time, and there is no question but that the large interests here, in most cases, will establish new high records for volume for the year, notwithstanding the heavy inroads made by some of the new entries into the eastern territory.

Reports of tank car business down to 9 cents per gallon are still fairly frequent, and it is pretty well established that some sales have been made down to that level. The volume of this business, however, and the quantities available at the 9-cent level are by no means sufficient to "make the market" at that figure, and 9½ cents per gallon appears to be a fair average price for U. S. Motor at refineries in this area. One seller is still reported offering U. S. Motor for shipment from the Gulf at 8½ cents per gallon, c.i.f. New York, although no actual confirmation of business being done at that level has been available.

While price shading on U. S. Motor gasoline is general, the same is not true of the market for premium motor fuels. Refiners have continued to quote firm prices on their branded premium gasolines, and business on these higher priced lines is showing steady expansion. The maintenance of a normal profit margin on the premium grades has done much to make for a better all-around market situation from the standpoint of the refiners.

Tank Wagon Gasoline

Prices in tank wagon markets in eastern territory remain unchanged this week. There are still numerous instances of local cutting reported but none of the large companies has made any changes in its general schedules.

The feature of the tank wagon market this week was the inauguration of an extensive publicity campaign on the part of Standard Oil Co. of New York, featuring Ethyl gasoline, which it has just added to its premium motor fuel line. Most of the large eastern companies are now featuring Ethyl as a premium grade.

Lubs

Cylinder stocks have failed to maintain the advances attained during the preceding week, and the market is off all along the line. Buying has been fairly well maintained, but operators have succeeded in inducing refiners to grant slight concessions, which are reflected in the local price basis. Spot 600 steam refined is quoted at 31½ cents per gallon, with 635 at 33½ cents and 650 at 37½ cents. On 600 Pennsylvania flash the market is quoted at 43 cents, with 630 flash at 47 cents. Warren E, 600, is offered at 40 cents, with Oil City E 1 cent per gallon lower. Bright stocks have also eased off, with light quoted at 60 cents and dark at 58 cents per gallon.

Export buyers have come into the market for cylinder stocks in fair volume this week, and there is a good amount of buying reported for prompt shipment and delivery over the first half of September. In addition to this new business, domestic compounders and blenders have also extended their operations somewhat, both on spot lubs and nearby positions.

Inquiry for red and pale oils has shown a little improvement this week, and the market is showing a fairly steady tone. Industrial demand is on the increase.

Paraffin Wax

A better feeling has developed in the spot market, and prices are fractionally higher on practically all grades. Spot 120-122 a.m.p. is a quarter cent up at 3¾ cents per pound, with 125-127 a.m.p. showing a 10-point advance at 4 cents per pound. On 133-135 a.m.p. the market is an eighth higher at 5⅞ cents per pound, with 135-137 a.m.p. showing a corresponding increase to 6 cents per pound.

Domestic buying of fully refined grades has picked up appreciably, and the market situation has been aided by fairly heavy export buying of crude scale. Although refiners' stocks are still rather top heavy, first hands are showing stronger price views, and there has been a marked easing off in selling pressure both locally and at the Gulf.

Kerosene

A better feeling has developed in the tank car market in the East, in line with renewed firmness reported from Group 3 territory. Refiners are still booking water white at 7¾ cents per gallon, however, although the "official" posted price continues at 8 cents per gallon. The better tone now ruling is evidenced by the fact that sellers who last week were willing to do 7½ cents per gallon on water white have now revised their price ideas upward and are firm at 7⅝ to 7¾ cents per gallon. Some operators apparently are of the belief that 7¾ cents represents the low price for the summer, and are beginning to show interest in forward committments in anticipation of a good fall buying movement.

Tank wagon kerosene business has picked up a little throughout the eastern territory this week, and refiners and marketers are anticipating an early start to the fall buying movement. The quotation continues unchanged at 15 cents per gallon in local territory, and it now appears likely that this price will remain undisturbed over the remainder of the year, making more than two years during which the 15-cent level has prevailed. This is a degree of stability not approached by other refined products in retail markets.

Fuel Oil

Refiners have been busy making fuel oil deliveries this week to marine consumers. There was a record number of transatlantic arrivals in the local port during the week, and the presence of so many of the "big fellows" in the harbor at one time kept the barge fleets of the large companies busy in their bunkering operations.

Marketwise, there have been no changes in the bunker "C" situation during the week. Consumption is showing steady expansion, and notwithstanding the top-heavy supplies for the country as a whole, the statistical position of the East Coast market is favorable. While the question of a price advance in the spot market basis has died down somewhat as a topic of interest among oil men here, it is known that the principal interests in the fuel oil market have by no means abandoned the idea of a mark up. Producing costs are higher, due to the strong tanker market, and it is still believed here that the market will be at $1.15 to $1.25 per barrel, at refinery terminals, before the end of the year. Industrial demand is picking up somewhat, and the outlook favors heavy consumption during the coming winter season.

Diesel Oil

The outstanding feature of this week's market was the opening of bids for the Shipping Board's Diesel oil requirements at Balboa, Canal Zone, for 40,000 bbls. per month for one year beginning September 1, 1929. Standard Oil Co. of New York was the low bidder at $1.39 per barrel, other bidders being Asiatic Petroleum Corp. of New York, $1.75 a barrel, and Union Oil Co. of California, $1.63 per barrel. The bid of the New York company was extremely low in view of the strong market for Diesel.

Consumption of Diesel oil has been well maintained, and the market at East Coast terminals is in strong position at $2 per barrel, in bulk, f.o.b. terminals, with the usual charge for lighterage alongside within the harbor limits. The larger refining interests here are carrying contract business on their books over to the end of the year on this basis.

Gas Oil

Business has held up fairly well throughout the week, with the market held at 5¼ cents per gallon for recycled oil and no straightrun offered in the spot market. Refiners are showing firmer views on gas oil and while some stocks can still be had as low as 4½ cents on the spot position, sellers are showing more inclination to hold for the higher prices, particularly in view of the fact that the demand for gas oil as furnace fuel is expected to show an early increase.

Export Markets

Continued quiet is reported in the Gulf export market. The only development this week was an inquiry for 1,000 to 2,000 tons of U. S. Navy specification gasoline, for delivery c.i.f. France, and this business had not been placed up to the time of writing. There is a steady movement of motor fuel out of the Gulf for the Spanish Petroleum Monopoly, but in as much as this gasoline is moved under private contract the prices involved have no influence on the open market.

Export operators express the opinion that Europe is drawing heavier supplies from the Black Sea in view of the current lack of buying of gasoline and other products for shipment to the Continent. The price on export gasoline this year is more favorable than for several years past, Gulf basis.

No cargo inquiries for kerosene were reported during the week, and the Gulf basis remains unchanged. There is a good movement reported in less than cargo lots, however, both at the Gulf and at North Atlantic ports. Fair-sized shipments of kerosene have been moving out from New York and other eastern ports for South America, Europe and some for African ports.

Operators have been looking for a better export inquiry for fuel oil out of the Gulf, but buying of this product continues on a hand-to-mouth basis, with the market showing a slightly better feeling owing to the higher charter market. The Gulf market has not been affected by this development as much as that in East Coast terminals, however.

Lubricating oil inquiry has picked up a little, and a better volume of business on cylinder stocks out of New York has been noted. It is expected by operators here that this business will be well maintained over the balance of the year, buying during the past several weeks having been under normal and stocks of European distributors, presumably, being smaller than usual at this time of year.

Paraffin wax has moved in slightly better volume into export channels this week. Foreign buyers have been able to pick up fully refined wax at attractive price levels in the field during recent weeks, and these purchases are now moving abroad. The movement is fairly heavy both in the East and through New Orleans and Houston.

Cased gasoline and kerosene is showing a steady undertone, with a good movement reported. Prices are withdrawn, sellers quoting only on specific inquiries from buyers.

Petroleum Exports

The following table shows principal exports of refined petroleum products from New York during the past three weeks (all figures in gallons unless otherwise noted):

	Week ended		
	Aug. 17	Aug. 10	Aug. 3
Gasoline	235,100	98,000	594,500
Naphtha	1,806,400	295,000	2,279,400
Kerosene	584,200	47,000	107,200
Fuel oil		11,000	120,000
Lubricating oil	1,648,900	987,800	1,094,700
Petr., refined	395,300	780,000	1,053,300
	Pounds		
Petrolatum		8,000	
Paraffin wax	1,718,900	787,400	1,033,100
Refined	93,000	25,000	22,500
Scale	71,400	264,500	181,000
Lubricating grease	1,525,600	563,200	757,900

Imports

Imports of crude and refined oils at the principal United States ports for the week ended August 17 totaled 1,757,000 bbls., a daily average of 251,000 bbls., compared with 1,796,000 bbls., a daily average of 256,571 bbls. for the previous week and a daily average of 271,178 bbls. for the four weeks ended August 17.

California Oil Receipts

Receipts of California crude and refined oils at Atlantic and Gulf Coast ports for the week ended August 17 totaled 406,000 bbls., a daily average of 58,000 bbls., against 349,000 bbls., a daily average of 49,857 bbls. for the previous week and a daily average of 75,429 bbls. for the four weeks ended August 17.

Distribution of total California oil receipts is as follows:

Gasoline	259,000
Fuel oil	70,000
Kerosene distillate	77,000

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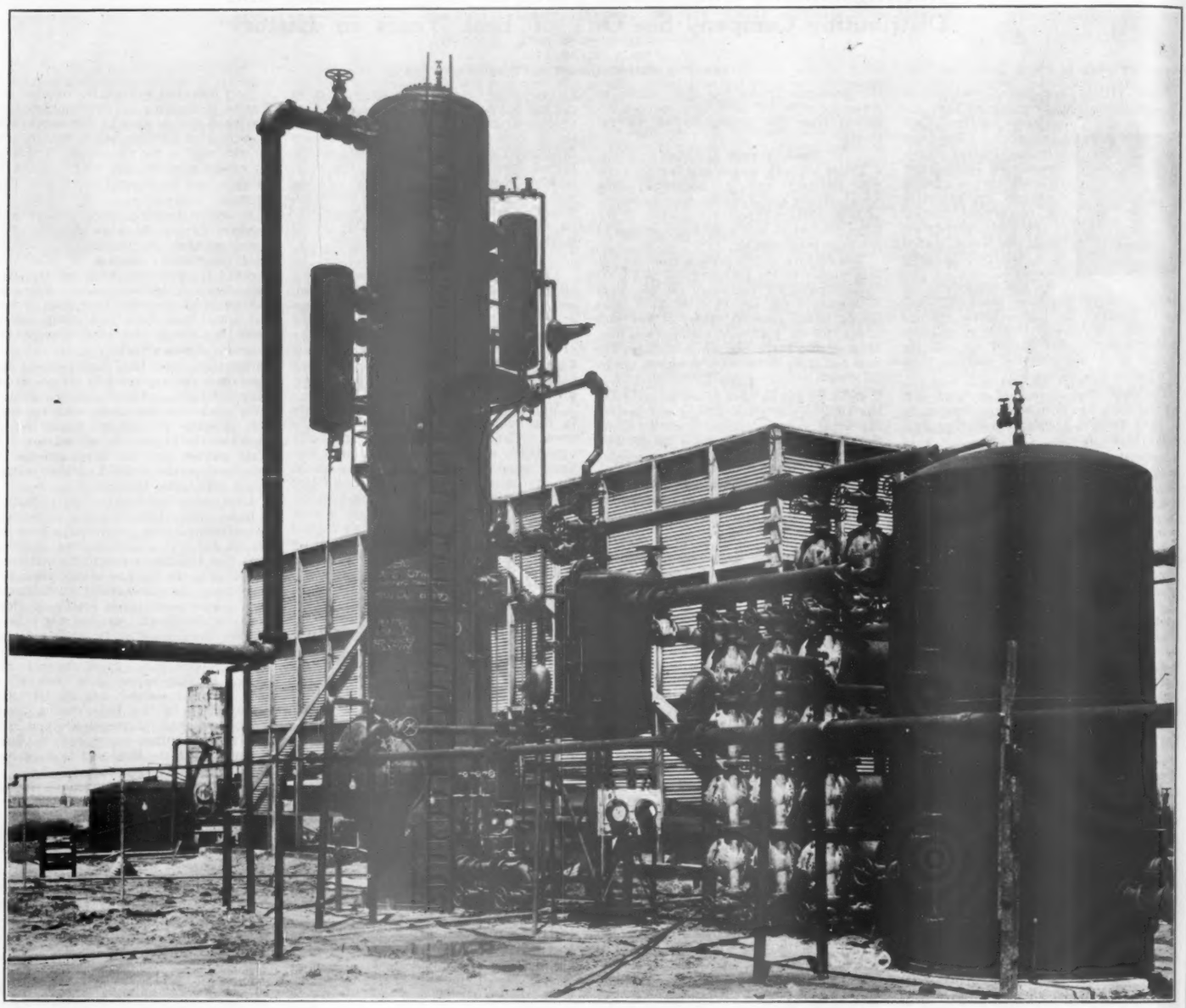

ERECO equipment at the Kingsmill, Texas, plant of the Forrest E. Gilmore Company. Another instance of the growing popularity of ERECO equipment with plant operators who are not in business for their health.

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Natural Gasoline Manufacture

SANTA FE SPRINGS LEADS IN WESTERN PRODUCTION

One hundred thirty-nine natural gasoline plants in California with a daily indicated capacity of 2,155,100,000 cubic feet, report a recovery of 73,764,342 gallons of natural gasoline from 54,938,475,000 cubic feet of gas treated in July. This is an increase of 3,268 bbls. in daily average production.

Utilization of natural gasoline amounted to 1,711,129 bbls., an increase over June of 140,344 bbls. Daily average utilization of 55,198 bbls. was 1,457 bbls. less than daily average production of 56,655 bbls.

Stocks of natural gasoline at the end of July amounted to 1,606,850 bbls., of which 34,788 bbls. were reported by natural gasoline plant operators and 1,572,062 bbls. by refinery operators. This is an increase of 64,831 bbls. over June stocks. This stock figure of 1,606,850 bbls. is approximately 29 days' supply at the current rate of consumption.

The Santa Fe Springs Field now leads in California natural gasoline production. Plants in that area during July processed 18,301,396,000 cubic feet of gas securing 22,739,000 gallons of natural gasoline. The Long Beach area produced almost as much natural gasoline, the output for the month totaling 20,508,000 gallons. The gasoline content of the gas is higher in the Long Beach area as is indicated by the fact that the July production was obtained from 11,840,541,000 cubic feet of gas.

Most of the new development in California has been in the Santa Fe Springs areas. The discovery of deep sand production added to the gas supply available from the shallower sands. Old plants have been enlarged and several new plants constructed. Among the newer fields in California the production of the Seal Beach area increased to a total of 3,882,000 gallons in July.

California Natural Gasoline Production, Distribution and Stocks, July, 1929

Production by Fields

Field—	Gas treated (thousand cu. ft.)	Natural gasoline produced (gals.)
Fullerton and Whittier	687,320	1,324,788
Midway	3,093,828	4,739,653
Huntington Beach	1,520,753	3,523,117
Long Beach	11,840,541	20,508,256
Richfield	1,199,182	1,439,594
Santa Fe Springs	18,301,396	22,739,035
Seal Beach	3,355,760	3,882,154
Ventura Avenue	7,603,588	6,666,073
All other fields	7,336,107	8,941,612
Total	54,938,475	73,764,342

Production

Type of plant—	Gas treated M.C.F.	Natural gasoline produced (gals.)	Gasoline recovery per M.C.F. gas treated
Oil absorption	40,063,557	53,206,646	1.328
Compressor	241,025	279,126	1.158
Combination Comp. and oil absorption	14,633,893	20,272,881	1.385
Drip	.....	5,689	....
Total	54,938,475	73,764,342	1.343

	Bbls.
Finished gasoline produced at plants	27,381

Distribution

	Bbls.	Bbls.
Stocks first of month		1,542,019
Produced during month		1,756,294
Quantity mixed with crude or unfinished oils	232,323	
Used in Blending at refineries	1,463,381	
Stocks end of month	1,606,850	
Used at plants, shortage and evaporation losses	15,425	
Balance	.....	19,666
	3,317,979	3,317,979

Stocks

	Gals. or Bbls.	
Natural gasoline held by natural gasoline plant operators	1,461,113	34,788
Natural gasoline held by refiners	66,026,604	1,572,062
Total	67,487,718	1,606,850

ISSUE ANNUAL PROCEEDINGS

The Natural Gasoline Association of America has completed a booklet containing the proceedings of the Eighth Annual Convention which was held at Tulsa May 21, 22 and 23. The booklet contains all the papers presented at the meeting, including the discussions. The third progress report of the association's research department is also a part of the report. The research report was prepared by Dr. G. G. Brown, professor of chemical engineering of the University of Michigan.

TO ENLARGE PLANT

The Empire Oil & Refining Co. of Bartlesville, Okla., is planning on enlarging its plant in Sedgwick County, Kansas. The plant at present has a capacity of 45,000 gallons daily and this will be enlarged to 60,000 gallons daily.

The plant, which is located near Wichita, Kans., operates with gas from the main natural gas line of City Service interests of which the Empire is a subsidiary. The gas capacity of the line is to be increased and this will necessitate a greater capacity at the gasoline plant.

MONTANA PLANT

The Vashti Petroleum Co. is considering the construction of a gasoline plant in the Devon shallow gas field of Montana. A gas well has been completed in the field at a depth of 784 feet. The gas contains sufficient gasoline to justify the operation of a gasoline plant. Additional wells are to be drilled.

SALES OF SKELGAS SHOW 845 PER CENT INCREASE

The sale of "Skelgas," a liquefied gas manufactured by the Skelly Oil Co., increased 845 per cent the first seven months of this year over the same period last year, according to a company announcement. The liquefied gas is manufactured at natural gasoline plants operated by the Skelly company. The gas consists of the lighter hydrocarbons removed from the natural gasoline.

A total of 1,190 cylinders of this bottled natural gas were sold in 1928 period as compared with 11,250 cylinders up to August 1, this year. This ratio will be increased by the Skelly company during the balance of the year as dealers are being added daily and new territory is constantly being annexed. "Skelgas" is sold only in communities where natural or artificial gas are not available. The company sells both the "Skelgas" and equipment for using the bottled natural gas, including gas ranges. The product will soon be available for illuminating as well as cooking through perfection of a special gas mantle for that purpose.

TABER GAS PROJECT

CHATHAM, Ontario, Aug. 26.—Ratepayers of Taber, Alberta, have approved the granting of a natural gas franchise to the Canadian Western Natural Gas, Light, Heat & Power Co. of Calgary. The work of laying the local distributing system has been commenced.

ENLARGE CARBON PLANT

The carbon black plant of the Cabot Carbon Co. at Wewoka, Okla., will be operating at capacity within a few weeks. The plant, which started operating in July, is the first carbon black plant in Oklahoma. It is located in Section 12-8-6 of Seminole County.

The plant has 37 burners, several of which are now operating. The plant is operating with residue gas secured from the gasoline plants of the Sinclair Oil & Gas Co. It is expected that the capacity of the plant will be increased later in the year.

SINCLAIR OPERATING TWO PLANTS IN SASAKWA POOL

The Sinclair Oil & Gas Co. last week started operating two plants in the Sasakwa Pool of Seminole County, Oklahoma. One plant of 10 units is located on the Davis lease of the Sinclair company in Section 7-6-8. The company has producing wells on this lease with a daily average production of approximately 6,000 bbls. daily.

The new plant is the combination gas lift and gasoline plant type. The wells which have been flowing naturally are to be operated with the gas lift. It is expected that the recycle gas as to gasoline content will be similar to other Wilcox sand wells in the Greater Seminole area.

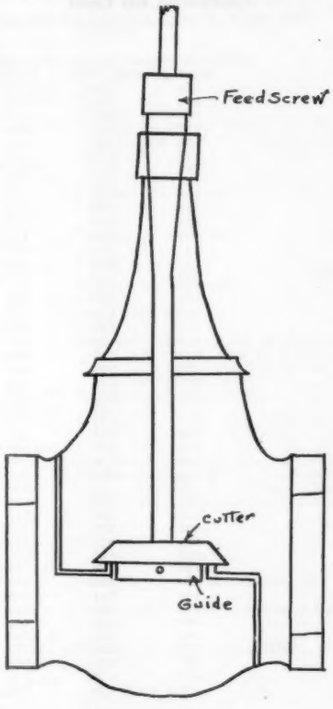
In Section 5-7-7 the Sinclair company also started a four-unit plant. Gas in this area from the wells flowing naturally has shown a gasoline content of from 4 to 4½ gallons per 1,000 feet. The company expects to increase the capacity of this plant to eight units soon.

Work on the new Sinclair plant in the Oklahoma City Pool is progressing rapidly. The plant, which will be the largest in the field, will have a capacity of 50,000 gallons daily. The plant is of the oil absorption type and will operate with well pressure.

A PRACTICAL SUGGESTION

VALVE RESEATING TOOL

Although gasoline plants using vertical engines and horizontal four-cycle gas engines have special valve reseating tools, very few engineers really know that there are valve reseating tools for pipe lines. There are small kits of tools which carry a sufficient assortment of cutters to reseat valves from one-eighth-inch to 3-inch and are reasonably priced. The valve is left in the line when being reseated and is suitable for balanced valves, gauge cocks, globe valves, lubricator valves, compression bibbs and ball cocks. The operation requires but a few minutes.



Valve reseating tool.

A typical valve reseating tool giving satisfactory results, has cutting blades that are parallel and produces an offset or shaving cut. Each blade is made with both a flat and a taper cutting surface. A bit brace is used for rotating but pressure is supplied by a screw feed. The cutter rotates on a level plane and is advanced by slight turns of the feed screw until the job is done.

The tool lines up through a taper sleeve screwed into the bonnet of the valve. There is also a guide below the cutter, a disc with frequent ball bearings set in the outer edge. These ball bearings are backed up by springs which give them a powerful outward thrust.

It is possible to reclaim many valves, with this simple tool, which otherwise would not be salvaged. It also will prevent leaky valves which will effect a saving in plant operation. We can realize the magnitude of leaks by the following table:

Leakage	Loss per Minute	Hour	Day	Month
A drop per second	1/10 oz.	6 oz.	1½ gals.	34 gals.
Two drops second	1/3 oz.	20 oz.	2⅔ gals.	2 bbls.
Drop breaking into stream	2 oz.	1 gal.	24 gals.	14 bbls.

Practical suggestions by those connected with the construction and operation of natural gasoline plants are invited. Payment will be made as soon as suggestions are accepted. Address all communications to the Natural Gasoline Department, The Oil and Gas Journal, Tulsa.

FAVORS USE OF SHEET ALUMINUM FOR GASKETS

By W. F. Schaphorst, M.E.

In the July 11 issue of The Oil and Gas Journal, page 137, is a "practical suggestion" pertaining to a gasket cutter. The writer of the suggestion says:

"Very few gasoline plant operators or construction men know that there is a special tool made for cutting gaskets. The usual method is to use a ball pein hammer and make the impression of the face and then cut with a knife or make the gasket altogether by battering with the hammer. This practice in some cases spoils the face of the metal, wastes gasketing materials and may cause fracture of metal."

While it is true that in the old days gaskets were usually made by hand, that method is decidedly out of date today. The modern method is to let factories do the work. Mass production as performed in the average factory of today makes the cost much less than the cost of individual hand labor for making one gasket. Besides, the factory-made gasket is far superior to the hand-made gaskets.

Factory gaskets are made in all sizes to meet every gasket requirement. A great many can be ordered and kept in stock. They keep indefinitely without deteriorating in the least.

Armor-Clad Gasket

For example I have in mind a modern armor-clad gasket which will withstand the most severe high-pressure, high-temperature and even acid conditions. Condensation in the lines has no effect. A simple one-piece aluminum armor is spun

(Continued on Page 359)

Brief Items for Petroleum Refiners

PETROLEUM DIVISION MEETS IN MINNEAPOLIS

A large attendance of petroleum chemists is assured for the annual meeting of the Division of Petroleum Chemistry of the American Chemical Society, which will be held at Minneapolis, September 10 and 11. Thirteen technical papers concerned with recent research work of special interest to refinery operators will be presented at the annual meeting. Wednsday afternoon there will be a symposium and round table discussion on grease.

The annual business meeting and election of officers will be held at the close of the first session on Tuesday. The Petroleum Banquet will be held Wednesday evening.

J. Bennett Hill of the Atlantic Refining Co., Philadelphia, is chairman of the Petroleum Division. C. L. Johnson of the Independent Oil & Gas Co. is secretary.

Following is the program for the two-day meeting:

Tuesday, September 10

2 p. m.—C. J. Livingstone and W. A.

(Continued on Page 351)

S. D. HASTINGS KILLED IN PLANT EXPLOSION

CHICAGO, Aug. 23.—Samuel D. Hastings, Jr., and Arthur J. Rollin, both widely known oil men were killed by an explosion which wrecked the office and warehouse building of the Barkhausen Oil Co., Green Bay, Wis. Three others were injured. One man was a truck driver for the Barkhausen company, who was badly burned, and two city firemen injured by flames and smoke.

The explosion occurred at a late hour in the afternoon of Thursday, August 22. Mr. Hastings and his office manager, Arthur Rollin, were in the private office at the time. Mr. Hastings was blown through a window his body being found outside of the office. He was very badly burned about the head and down the back, dying at the hospital about an hour and a half after the explosion without regaining consciousness. The body of Mr. Rollin was found in the office the next morning under a pile of wreckage.

City and county authorities have begun an investigation. A truck was being loaded with gasoline and it is believed that the motor was running. The loss is estimated at $50,000. Considerable damage was done to the plant.

Samuel D. Hastings, Jr., was the secretary-treasurer of the Barkhausen Oil Co. and its general manager. He was the son of Judge Samuel D. Hastings, the oldest circuit judge in Wisconsin. Mr. Hastings had been identified with the Barkhausen Oil Co. for many years. He was well known to oil men in all parts of the country and particularly in Chicago where he was a frequent visitor. He was active in the organization of the Dixie Jobbers Association of Wisconsin of which he was an officer and in the Wisconsin Oil Men's Association as well as the national associations.

SAUNDERS WITH IMPERIAL

J. B. Saunders, who for the past four years has been in charge of Arkansas and southeastern sales for the Kettle Creek Refining Co., El Dorado, has been appointed sales manager of the Imperial Refining Co. of Tulsa. Mr. Saunders succeeds R. M. Moon, who has resigned to enter private business in Tulsa.

Mr. Saunders will have general charge of tank car sales for the Wickett Refining Co. and the San Angelo Refining Co., which are affiliated with the Kettle Creek and Imperial companies.

STANDARD COMPANIES RECOMMEND PRODUCTS FOR AVIATION INDUSTRY

NEW YORK, Aug. 26.—Stanvao Specification Board, appointed and maintained by the Standard Oil Co. of New Jersey, Standard Oil Co. of California, and Standard Oil Co. of Indiana, has started operations with headquarters in this city, to work for the advancement of aviation and the recommendation of standardized grades of petroleum products for use by the aviation industry.

In its initial announcement the board says: "Experience has shown that the safe and rapid progress of aviation depends upon widespread distribution of the highest quality oil products under brand and grade names which shall be the same everywhere. Then engine manufacturers and operators of aircraft can safely and intelligently select a product best meeting their requirements and be assured of obtaining that product by the same designation wherever the airplane may travel.

"Accordingly, Standard Oil Co. of California, Standard Oil Co. of Indiana, and Standard Oil Co. of New Jersey have cooperated to advance aviation by organizing an expert board of chemists and engineers skilled in the refining and testing of oils as well as in the operation of aircraft engines. The functions of this board are:

"First, to determine the properties of the best oil products which can be produced for aviation uses, and to define these properties by complete scientific specifications.

Brand and Grade Names

"Second, to adopt brand and grade names for the identification of the products determined to be the best, so that they may be distributed commercially under labels which will identify them anywhere in the world.

"Third, to prescribe and continuously regulate tests and testing methods so rigid as to insure absolute uniformity of the products sold under its brand.

"The board has now adopted specifications for three grades of lubricating oil for aircraft engines. This oil will be distributed universally under the trade mark Stanavo with the accompanying symbolic picture of an American eagle modeled into the outline of a monoplane. The oil will be known as Stanavo Aviation Engine Oil, Nos. 100, 120, and 140. The grade numbers designate the nominal Saybolt viscosities of the respective oils at 210 degrees Fahrenheit. The following chart indicates the correct grades of Stanavo Aviation Engine Oils for use in most of the types of aviation engines manufactured in the United States."

For Normal Operations

The above recommendations, the board explains, are intended to apply to aircraft engines when normally installed and operated at load and speeds under average indicated temperature conditions. For abnormal operations, the board states, it may be advisable to apply special recommendations. For example, in temperate zones, apply tropical recommendations for heavy load operations and continued above normal engine speeds under high atmospheric temperatures, and the frigid recommendations for special cold weather operations, such as altitude photographic flying, engine throttled; installations with exposed piping; short flights when airplanes are not housed in heated hangars.

While the principal oil companies came together some months ago and organized a committee to work with airplane engine manufacturers in the development of standard grades of aviation motor fuel and lubricating oil, and to endeavor to get the marketing of these products on a more efficient basis, organization of Stanavo Specification Board marks the first co-operative effort of large companies to bring order out of the chaos which has marked the development of special petroleum products for the aviation industry.

Further recommendations will be made by the board in the future.

Lubricating Oil Chart

The chart of recommendations follows:

Manufacturer or agent, and engine—	Temperature zone recommendations tropical	temperate	frigid
Aeromarine-Klemm Corp., Salmson AD-9B-1	120	120	100
Aircraft Engine Co., Comet	120	120	100
Alliance Aircraft Corp., Hess Warrior	120	120	100
Allison Engineering Co., V (G) 1410, V-1650	140	120	120
American Cirrus Engines, Inc., Cirrus	120	120	100
Axelson Machine Co., Axelson	120	120	100
Bliss, E. W., Co., Jupiter Series	140	120	100
Brownback Motor Laboratories, Brownback	120	120	100
Continen al Motors Corp., A-70	120	120	100
*Curtiss Aero & Motor Co., OX5, OXX6	120	120	100
*Curtiss Aero & Motor Co., C6A, K6	120	120	100
Curtiss Aero & Motor Co., Challenger	140	120	100
Curtiss Aero & Motor Co., Chieftan	140	120	100
*Cur iss Aero & Motor Co., D-12	120	120	100
*Curtiss Aero & Motor Co., Conqueror V (G) 1570	140	120	100
Dayton Airplane Engine Co., Bear	120	120	100
Fairch ld Aviation Corp., Genet-Mark 111	120	120	100
Hallett Manufacturing Co., H 526	120	120	100
*Harriss Motor Co., B1, B2	120	120	100
Irwin Aircraft Co., Irwin 79	120	120	100
Kimball Aircraft Corp., Beetle	120	120	100
Kinner Airplane & Motor Co., K5	120	120	100
LeBlond Aircraft Engine Co., 60, 90	120	120	100
Lycoming Manufacturing Co., Lycoming R-645	120	120	100
Menasco Motors Co., B-2 Salmson	120	120	100
Michigan Screw Corp., Rover	120	120	100
National Aero Corp., Cameron 4, 7	120	120	100
*Packard Motor Car Co., 1500, 2500, 2775	120	120	100
Prat. & Whitney Aircraft Co., Wasp	140	120	100
Pratt & Whitney Aircraft Co., Hornet	140	120	100
Quick Motors Co., Quick Radial	120	120	100
Spartan Aircraft Co., Walter, 5, 7, 9	120	120	100
Siemens & Halske A. G., Yankee, 5, 7, 9	120	120	100
Szekely, O. E., Corp., SR-3, SR-5	120	120	100
Tips & Smith, Inc., Super Rhone	120	120	100
*United States Government, Liberty 12A (HC)	120	120	100
Velie Motors Corp., Velie M-5, M-7, L-9	120	120	100
Warner Aircraft Corp., Scarab	120	120	100
Wright Aeronau ical Corp., Whirlwind, J-4, J-5	140	120	100
Wright Aeronautical Corp., Wright R-540	140	120	100
Wright Aeronautical Corp., Wright R-760	140	120	100
Wright Aeronautical Corp., Wright-R-975	140	120	100
Wright Aeronautical Corp., Cyclone R-1750	140	120	100
*Wright Aeronautical Corp., Hispano Suiza	140	120	100
Wright Aeronautical Corp., Gypsy	120	120	100
Wright Tuttle Aircraf. Motor Corp., WT-5	120	120	100

*Water cooled.

TO MERGE PARAGON AND VALVOLINE COMPANIES

Negotiations are under way providing for the consolidation of the Paragon Refining Co. and Valvoline Oil Co., according to E. W. Edwards, president of the former company. The merger, which has been reported in trade circles for several months, if completed, will combine the operations of two large independent refining and marketing concerns.

The Paragon company operates a 10,000-bbl. refinery at Toledo with approximately 300 bulk and retail stations in Ohio and Michigan. The company, through subsidiaries, is also engaged in crude oil production and pipe line transportation in Ohio, Kentucky and Michigan. A subsidiary company also buys and transports oil in Kansas.

The Valvoline company operates a 3,000-bbl. refinery at East Butler, Pa., and a 1,000-bbl. plant at Warren, Pa. The West Virginia Pipe Line Co., a subsidiary company, operates a 1,500-mile pipe line system in western Pennsylvania, West Virginia and Ohio. The company has a large terminal at Edgewater, N. J. The company operates 70 branches and stock depots in United States and 24 in Great Britain and its dependencies.

BUYS PANHANDLE STATIONS

The Louisiana Oil Refining Corp. has purchased the marketing properties of the Panhandle Oil Co. of Mississippi, according to an announcement of the past week. The properties consist of bulk and service stations at 58 points in Mississippi. The Panhandle company is a subsidiary of the Panhandle Producing & Refining Co. of Wichita Falls, Tex.

The Louisiana corporation also purchased two bulk plants and 16 service stations of the Moore Oil Co. and three bulk plants and 15 service stations belonging to the Cook Oil Co. These properties also are located in Mississippi.

The Louisiana Oil Refining Corp. of Shreveport recently announced its plans to purchase and build stations in the Southwest. The corporation recently sold its properties in Ohio and Kentucky and will center its marketing at points closer to its refinery properties which are located at Shreveport.

CHANGES IN MID-CONTINENT

C. R. Olson, sales manager of the St. Louis division of the Mid-Continent Petroleum Corp. has been appointed sales promotion manager with headquarters at the general offices of the corporation in Tulsa. Mr. Olson will take charge of the new department September 1.

Lucien Graham, Jr., assistant manager of the St. Louis division, has also been transferred to the Tulsa offices as manager of the Oklahoma marketing division. Mr. Graham succeeds J. C. Miller who will devote his time to the sale of lubricating oils in the general sales department.

S. B. Caldwell, division operating manager, succeeds Mr. Graham as assistant division manager and T. L. Elrod, assistant division operating manager, becomes division operating manager.

RECONDITIONING SIMMS PLANT

The Simms Oil Co. has shut down its Dallas, Tex., refinery in order to install new equipment. The refinery is being generally reconditioned and new installation and tower equipment installed. Approximately $250,000 is being spent by the company. The plant will resume operation next month.

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 332)

Underwood's No. 1 Tisdale, 2,095 ft. N and 1,185 ft. from E Sec. 74, Blk. LL ..... Spudded and shut down.

SCURRY COUNTY

Camp Spring Oil & Ref. Co.'s No. 3 Guinn, 1,300 ft. from S, 300 ft. from E Sec. 12, Blk. 3, H.&T.C.R.R. Sur. ..... Shut down 320 ft.

Cottingham & Briscoe's No. 1 Trees, C SE Sec. 147, Blk. 97 ..... Drlg. 1,110 ft.

I. B. Mimms et al's No. 1 J. J. Koonsman, Sec. 216, Blk. 2, H.&T.C. Sur ..... Spudded and shut down 300 ft

G. E. Dickman and R. B. Pender et al's No. 1 F. C. Davis, 1,000 ft. N and 1,770 ft. W of SE cor. of Sec. 275, Blk. 2, H.&T.C. Sur. ..... Fishing 3,700 ft.

Texas-Canadian's No. 1 Moore, 1,320 ft. from S and W Sec. 379, Blk. 97 ..... Location.

SUTTON COUNTY

Phillips Pet. Co.'s No. 1 A. G. Holman, 2,310 ft. S and 330 ft. W NE cor. Sec. 25, G.C.S.D.&N.G.R.R. Sur. .... Fishing 6,635 ft.; making 1,500,000 ft. gas 6,635 ft.

L. G. Priest's No. 1 Allison, 1,320 ft. N and E of SW cor. Sec. 52, Blk. A, T.&P. Sur. ..... Set 15-in. casing 530 ft.; shut down 3,660 ft.

TAYLOR COUNTY

Dunnigan & Shell Pet. Corp.'s No. 1 Davidson, 2,311 ft. S and W of NE cor. S half of W. R. Willis Survey No. 122 ..... Drlg. 705 ft.

V. B. Jameson's No. 1 Webb, 1,170 ft. S and W of NE cor. Sec. 46, Lunatic Asylum Land ..... Drlg. 4,925 ft.; show oil 4,917 ft.

Magnolia Pet. Co.'s No. 1 Hammer ..... Drlg. 3,050 ft.

Mid-Continent Oil & Gas Co.'s No. 1 Cody, 330 ft. N and E of SW cor. M. E. Cody 116.7-acre tract, Guadalupe County School Land ..... Shut down 2,260 ft.

Root Drlg. Co.'s No. 1 Martin, 990 ft. E and 1,650 ft. N of SW cor. Sec. 20, Blk. 19, T.&P.R.R. Sur. ..... Drlg. up pipe; total depth 3,475 ft.

TERRELL COUNTY

Big-Bend Oil Co.'s No. 1 Bassett, C NW Sec. 155, Blk. D, M.K.&T.E.R.R. Sur. ..... Underreaming 1,150 ft.; to shut off hole full of water.

Keck Pecos Trust Co.'s No. 1 Hamilton, C Sec. 6, Blk. D-7, E.L.R.R. Sur. ..... Drlg. 2,630 ft.

Mrs. J. B. McGhee's No. 1 Sam Belt, C Sec. 78, Blk. D-7, E.L.&R.R. Sur. ..... Shut down 880 ft.

Milham Exploration Co.'s No. 1 Bassett, Sec. 76, Blk. Y, W. E. Robertson Sur. ..... Cem. 6⅝-in. casing 3,986 ft.; drlg. 5,300 ft.

Woodley & Jones' No. 1 Pankenham, C SE NW Sec. 43, Blk. B-2, C.C.S.D.&N.G.R.R. Sur. ..... Shut down 625 ft.

TERRY COUNTY

Kingsland O. P. Co.'s No. 1 Brownfield, C NW SW SW Sec. 7, Blk. 1-A, E.L.R.R. Sur. ..... Fishing bailer 5,080 ft

TOM GREEN COUNTY

Cannon and others' No. 1 Rust, 990 ft. S, 990 ft. W of NE cor. of Sec. 745 ..... Rig.

Fitzgerald & Tallaferro's No. 1 Bennett, C SW Sec. 1,628, E. H. Ringer ..... Drlg. 1,980 ft.

Fuhrman Pet. Co.'s No. 1 Wardlaw, 2,650 ft. from N and E of Sec. 6, Blk. 17, E.&T.C. ..... Location.

UPTON COUNTY

Cranfill & Reynolds' No. 1, 220 ft. each way from N line, Sec. 15, Blk. 5, H.&T.C. Sur. ..... Location.

Dixie Oil Co.'s No. 30 Burleson, 990 ft. from N and 2,640 ft. from E Sec. 2, John Nidever ..... Top pay 2,035 ft.; total depth 2,045 ft.; swabbing 155 bbls. in 9 hrs.

Dixie Oil Co.'s No. 31 Burleson, 330 ft. from N and 660 ft. E, Sec. 2 ..... Location.

Humble Oil & Ref. Co.'s No. 12 Ricker, 5,008 ft. from NW, 150 ft. from NE line, Denton Survey ..... Location.

Prairie Oil & Gas Co.'s No. 1 Quatters, 330 ft. from S and 1,980 ft. from W C. C. Dewitt Sur. ..... Drlg. 795 ft.

T. P. Coal & Oil Co.'s No. 13-A Lane, 330 ft. from S, 660 ft. from E of No. 5-A ..... Location.

VAL VERDE COUNTY

Independent Operators' No. 1 Whitehead, SE SE Sec. 30, Blk. 4, I.&G.N. Sur., elev. 1,175 ft. ..... Shut down 4,850 ft.

O. O. Owens' No. 1 Mills, Sec. 128, Blk. 1, L.&G.N. Sur., elev. 2,130 ft. ..... Gas sand 2,491-2,520 ft.; tested 125,750 ft. gas; reset 8-in. 2,511 ft.; cleaning out 4,210 ft.

Phantom Oil Co.'s No. 1 Ingram, 1,320 ft. from S and W Sec. 44, Blk. D-8, G.C.&S.F.R.R. Sur. ..... Location.

Producers Oil Co. et al's No. 1 Everett Bros., 2,310 ft. S and 330 ft. E of NW cor. Sec. 40, Blk. DB, C.C.S.D.&R.G.N.G. Sur. ..... Shut down 3,100 ft.

Dyar Bros. et al's No. 1 Wilson, 6,830 ft. N NE cor. Sec. 1, T.&P. Sur., thence 1,680 ft. E Sec. 115, Blk. E, G.C.&S.F. Sur. ..... Fishing 3,472 ft.

Valvert Oil Corp.'s No. 1 Bassett, C NE Sur. 47, Blk. Y.. Set 15½-in. casing 767 ft.; set 10-in. casing 1,510 ft.; shut down 3,900 ft.

WARD COUNTY

Alpine Oil & Gas Co.'s No. 1 Boogher, 1,980 ft. SE and NE Sec. 11, Blk. 5, H.&T.C. ..... Top salt 760 ft.; cem. 8-in. casing 758 ft.

Atlantic et al's No. 1 Dorr, 1,730 ft. S, 990 ft. W, Sec. 2, J. Howe ..... Rigging up machinery.

C. C. Dorr et al's No. 1 Costley, 1,722 ft. from NW, 990 ft. from NE line of Sec. 2, Jos. Howe Sur. ..... Location.

Cranfill & Reynolds' No. 1 Robeson, 220 ft. NW and NE Sec. 15, Blk. 5, H.&T.C. ..... Rigging up machinery.

Continental Oil Co.'s No. 2 Sealey, 330 ft. S and W Sec. 51, Blk. A, G.M.M.B.&A. Sur. ..... Drlg. 1,550 ft.

Gulf Prod. Co.'s No. 2 Hutchins, 330 ft. N and E Sec. 7, Blk. O ..... Top salt 1,240 ft.; top pay 2,528 ft.; 2,000,000 ft. gas; 65 bbls. of oil daily; total depth 2,763 ft.; flowing 45 bbls. daily.

Barstow Oil & Gas Co.'s No. 1 Monroe, Sec. 50, Blk. 33.. Spudded and shut down.

Gulf Prod. Co.'s No. 6 O'Brien, 2,310 ft. from N, 330 ft. from E Sec. 20, Blk. F, G.M.M.B.&A. Sur. ..... Top salt 1,076 ft.; drlg. 2,298 ft.; cem. 8-in. casing 2,381 ft.

Gulf Prod. Co.'s No. 2 Wristen, 220 ft. NW, 1,470 ft. SW Sec. 18, Blk. 5, H.&T.C. ..... Top salt 725 ft.; top pay 2,417 ft.; total depth 2,482 ft.; shot 200 qts. 2,416-68 ft.; flowed 110 bbls. daily; cleaning out 2,465 ft.

L. C. Harrison et al's No. 1 Wristen, 990 ft. from S and W lines of Sec. 26, Blk. B-28 ..... Location.

E. B. Lovelace et al's No. 1 Redman, 1,980 ft. NE of SW line and 1,980 ft. SE of NW line, Sec. 162, Blk. 34, H.&T.C.R.R. ..... Total depth 760 ft.; fishing.

Penn & Atlantic's No. 1 Pecos Mercantile Co., Sec. 16, Blk. 34 ..... Drlg. 1,633 ft.; 8-in. casing 1,633 ft.

Shipley et al's No. 1 Monroe, 330 ft. SE SW Sec. 3, Blk. 1 ..... Shut down 517 ft. for casing.

WINKLER COUNTY

Atlantic Oil Prod. Co.'s No. 6 Hendricks, 330 ft. S, 2,310 ft. W of NE cor. Sec. 44, Blk. 26, School Land ..... Drlg. 1,720 ft.

V. T. Bolin's No. 2 Brown et al, 2,000 ft. S and W of NE Sec. 4, Blk. B-5, Public School Land ..... Top salt 1,300 ft.; total depth 2,520 ft.; shut down 6-in. casing.

American Maracaibo Co.'s No. 2 Hendricks-B, 1,980 ft. N and 1,650 ft. E of SW cor. Sec. 28, Blk. B-5 ..... Cem. 12½-in. casing 170 ft.; top lime 2,599 ft.; top pay 2,731 ft.; 2,000 ft. oil; increase 2,875 ft.; show water 2,928-31 ft.; running 6-in. csg. 2,945 ft.; total depth 3,416 ft.; plugging back to 3,000 ft.; shut down.

Cranfill & Pickrell's No. 2 Hutchins, 2,310 ft. S and W Sec. 47, Blk. 26 ..... Drlg. 2,338 ft.

Gulf Prod. Co.'s No. 2-B Lum Daugherty, 2,310 ft. from N and 1,320 ft. W Sec. 22, Blk. 26, P.S.L. ..... Top lime 2,495 ft.; drlg. 2,499 ft.

Humble Oil & Ref. Co.'s No. 13-C Hendricks, 440 ft. from S, 330 ft. from W Sec. 10, Blk. B-12. ..... Top lime 2,548 ft.; drlg. 2,783 ft.

Humble O. & R. Co.'s No. 1-D Hendricks, 330 ft. from S, 2,310 ft. from W of Sec. 41, Blk. 26 ..... Building rig.

Liner Drlg. Co.'s No. 1 Campbell, 330 ft. from N and E cor. Sec. 2, Blk. B-5 ..... Shut down 2,005 ft. for funds.

Continental Oil Co.'s No. 1 Morton-A, 330 ft. N and E of Sec. 16, Blk. B-12 ..... Fishing bit 2,760 ft.

Shell-Llano Oil Co.'s No. 7 Scarborough, 1,020 ft. from N and W Sec. 2, Blk. 77 ..... Top salt 1,260 ft.; total depth 1,405 ft.

Skelly Oil Co.'s No. 3 Daugherty, 330 ft. W, 1,650 ft. S Sec. 22, Blk. 26, Public School Land ..... Top lime 2,440 ft.; cementing 8-in. casing 2,469 ft.; recement 6-in. casing set 2,505 ft.; drlg. 2,660 ft.

Skelly Oil Co.'s No. 5 Daugherty, 1,326 ft. W, 2,310 ft. S Sec. 22, Blk. 26 ..... Location.

Southern Crude O. P. Co.'s No. 4 Hendricks T-88-CX, 1,375 ft. N, 330 ft. E Sec. 21, Blk. 26 ..... Top lime 2,417 ft.; cem. 8-in. casing 2,529 ft.; total depth 2,762 ft.; preparing to run 6-in. casing.

Southern Crude O. P. Co.'s No. 2 Hendricks T-89-L, 440 ft. from N and 1,320 ft. from W Sec. 15, Blk. B-12... Drlg. 2,510 ft.

Southern Crude O. P. Co.'s No. 4 Hendricks T-90, 2,310 ft. S and E of Sec. 47, Blk. 26 ..... Top lime 2,242 ft.; total depth 2,255 ft.; cem. 8-in. casing 2,255 ft.; rigging up standard tools.

PETROLEUM DIVISION MEETS IN MINNEAPOLIS

(Continued from Page 350)

Cruse. "Carbon Deposits From Lubricating Oils—Experiments With Heavy Engines."

2:20 p. m.—C. S. Robertson and W. W. Scheuman, "Factors Influencing Motor Oil Performance.."

2:40 p. m.—J. C. Stauffer, J. K. Roberts and W. G. Whitman, "Determination of the Vapor Pressures of Naphtha."

3 p. m.—G. G. Brown and J. E. Miller, "Motor Fuel Volatility; 2—Effective Volatility as Related to Equilibrium Volatility and the A.S.T.M Distillation."

3:30 p. m.—George S. Parks and Samuel S. Todd, "The Heats of Fusion of Some Paraffin Hydrocarbons."

3:50 p. m.—Annual meeting; election of officers.

Wednesday, September 11

9:30 a. m.—J. C. Morrell and I. M. Levine, "Analysis of Olefin and Aromatic Hydrocarbons; Some Reactions of Olefins."

9:50 a. m.—W. F. Faragher, J. C. Morrell and I. M. Levine. "Determination of Olefin and Aromatic Hydrocarbons."

10:10 a. m.—S. C. Lind and George Glockler, "The Chemical Effect of Electrical Discharge in the Butane Fraction of the Liquid Products."

10:40 a. m.—F. R. Lang and Lowery Love, "Tube Corrosion From Burning Acid Sludge."

Wednesday, 2 P. M.

Symposium on Grease, R. R. Matthews, chairman.

M. F. Pratt and D. P. Weld, "A Modified Herschel Burrette Consistometer and Its Use in Determining the Consistency of Soap Thickened Oils."

F. L. Koethen, "Tests for Lubricating Grease and Their Relative Importance."

A. R. Lang, "Grease Making, Past and Present."

Round table discussion, led by James McKee.

A. L. MELLAR PROMOTED

A. L. Mellar, associated with Standard Oil Co. of New Jersey for the past 28 years, has been appointed manager of the fuel oil division of the sales department of the company, succeeding Gordon H. Michler, who has been transferred to Paris as a director and general sales manager of Leconomique Societe Anonyme de Petrole et Essence. Mr. Mellar first entered the company's employ in 1901 with a subsidiary company in Cleveland. In 1914 he was appointed assistant manager of West India Oil Co.'s Argentine branch, and in 1921 became a director of the Industrias Babel y Nervion in Spain. In 1924 he was transferred to Paris as one of the managing directors of Leconomique, where he remained until he returned to New York several months ago.

BEATY MADE CHAIRMAN OF TRANSCONTINENTAL

Amos L. Beaty has been elected chairman of board of directors of the Transcontinental Oil Co., succeeding Claudius H. Huston, who recently resigned at a meeting held in New York City. Mr. Huston also resigned as director of the company.

The following new directors were elected: M. G. B. Whelpley, vice president, Chase Securities Corp.; Theodore Schulze, president, Theodore Schulze Co., Inc., and Edward Robinett of Philadelphia, president of Stroud & Co. They succeeded M. L. Benedum, A. B. Daily, Jr., and J. L. Kirkland, whose resignations were accepted.

Other directors are F. B. Parriott, president; J. C. Adams, vice president; M. W. Bottomfield, vice president; J. M. Holliday, vice president; L. B. McCammon, vice president; E. D. Robinson, secretary and treasurer; C. F. Ericson, vice president of Gorrell & Co., Chicago.

TRINITY SAND TEST FINALLY ABANDONED

By Neil Williams

CORSICANA, Tex., Aug. 26.—After repeated failures in testing, C. F. Lytle's No. 1 Thompson, the Trinity sand test in the Mexia Field, one of the most interesting operations undertaken in the East Central Texas division, was abandoned the past week when it again swabbed salt water, filling up 500 feet with fluid. The test, the deepest drilled in this division, has been drilling for over a year and a half. Although it was intended the hole should go much deeper, the test was abandoned in a sand at 6,068 feet.

Work has been delayed on several occasions by fishing, and because of the bad hole it was decided to abandon it and start another test, location for which was made just 28 feet northeast of No. 1. The derrick and rig have been skidded over using two legs of the former derrick foundation as support for the derrick on the new location.

Daily average production of the area for the week ending August 24 was:

EAST CENTRAL TEXAS
Daily Average Production Week Ending August 24

Boggy Creek	2,785
Cedar Creek	100
Currie	452
Hill County	22
Mexia	5,297
Minerva	650
Nigger Creek	350
Powell	7,641
Richland	350
Thrall	22
Wortham	1,065
Total	18,744
Week ending August 17	19,149
Decrease	405

REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.

GASOLINE AND NAPHTHA

OKLAHOMA (Group 3)—	Aug. 27		Aug. 20		Aug. 13	
50-52 450 endpoint	.07½	.03¾	.07½	.07¾	.07½	.07¾
56-58 450 endpoint	.07¼	.07½	.07	.07¼	.07	.07¼
*58-60 437 endpoint (U. S. Motor)	.0776		.0778		.0753	
*60-62 437 endpoint	.0775		†.07¼	.07¾	†.07¼	.07½
*60-62 400 endpoint	†.08		.08		.08	
*64-66 375 endpoint	.085		.085		.0825	
68-70 360 endpoint	.08¼	.08½	.08¼	.08½	.08¼	.08½
64-66 437 endpoint (blend)	.07¼	.07½	.07	.07¼	.07	.07¼
NORTH TEXAS—						
56-58 450 endpoint	.07	.07¼	.07	.07¼	.07	.07¼
58-60 460 endpoint	.07	.07¼	.07	.07¼	.07	.07¼
58-60 437 endpoint (U. S. Motor)	.07¼	.07⅜	.07⅛	.07¼	.07⅛	.07⅜
60-62 400 endpoint	.07⅜	.07½	.07¼	.07⅜	.07¼	.07⅜
64-66 390 endpoint	.07½	.07⅝	.07½	.07⅝	.07½	.07⅝
64-66 375 endpoint	.07¾	.08	.07¾	.07⅞	.07¾	
68-70 360 endpoint	.08	.08¼	.08	.08¼	.08	.08¼
64-66 437 endpoint (blend)	.07	.07¼	.07	.07¼	.07	.07¼
***NORTH LOUISIANA—**						
58-60 437 endpoint (U. S. Motor)	.08½		.08½		.08¼	.08½
***ARKANSAS—**						
58-60 437 endpoint (U. S. Motor)	.08½		.08½		.08¼	.08½
PENNSYLVANIA—						
52-54 Naphtha	.08½		.08½		.08¼	.08½
54-56 Naphtha	.08⅛	.08¾	.08⅛	.08¾	.08⅛	.08¾
58-60 Gasoline	.08¾	.09	.08¾	.09	.09	.09¼
60 Gasoline	.09	.09¼	.09	.09¼	.09¼	.09½
62 Gasoline	.09¼	.09½	.09¼	.09½	.09¾	.10
64 Gasoline	.10½		.10½		.10½	
68-70 350 endpoint gasoline	.11		.11		.11	
CALIFORNIA—						
58-60 437 endpoint (U. S. Motor) domestic	.09	.10	.09	.10	.09	.10
CHICAGO DISTRICT (Based on Group 3)—						
50-52 450 endpoint (Naphtha)	.07¼	.07½	.07¼	.07½	.07¼	.07½
56-58 450 endpoint	.07¼		.07¼		.07¼	
58-60 437 endpoint (U. S. Motor)	.07½	.07¾	.07½	.07¾	.07¼	.07½
60-62 400 endpoint	.07¾	.08	.07¾	.08	.07⅝	.07⅞
64-66 375 endpoint	.08	.08¼	.08	.08¼	.08	.08¼
68-70 360 endpoint	.08¼	.08½	.08¼	.08½	.08⅛	.08⅜
64-66 437 endpoint (blend)	.07½		.07¼	.07½	.07⅜	.07⅝
GULF COAST (Export)—						
58-60 (U. S. Motor)	.08½		.08½		.08½	
60-62 400 endpoint	.09½		.09½		.09½	
61-63 390 endpoint	.09¾		.09¾		.09¾	
64-66 375 endpoint	.10		.10		.10	

*Louisiana, Arkansas, Mississippi and East Texas delivery.

*Weighted average prices August 26, 19 and 12, as reported by representative refiners. Sales to jobbers only. †No sales reported to jobbers. Price shows general market.

NATURAL GASOLINE

OKLAHOMA (Group 3)—	Aug. 27		Aug. 20		Aug. 13	
Grade A, 72-79.9, 375 e.p., rec. 90%	.06¾	.07	.06⅝	.06¾	.03⅜	.06½
Grade AA, 80-87.9, 375 e.p., rec. 90%	.06¾	.07	.06⅝	.06¾	.06¼	.06½
Grade B, 76-83.9, 375 e.p., rec. 85%	.06⅝	.06¾	.06½	.06⅝	.05⅞	.06
Grade BB, 84-92, 375 e.p., rec. 85%	.06⅝	.06¾	.06½	.06⅝	.05⅞	.06
Grade C, 80-90, 375 e.p., rec. 78%	.06⅝	.06¾	.06½	.06⅝	.05⅞	.06
NORTH TEXAS—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.06¾	.07	.06⅝	.06¾	.06⅜	.06½
Grade AA, 80-87.9, 375 e.p., rec. 90%	.06¾	.07	.06⅝	.06¾	.06¼	.06½
Grade B, 76-83.9, 375 e.p., rec. 85%	.06⅝	.06¾	.06½	.06⅝	.05⅞	.06
Grade BB, 84-92, 375 e.p., rec. 85%	.06⅝	.06¾	.06½	.06⅝	.05⅞	.06
Grade C, 80-90, 375 e.p., rec. 78%	.06⅝	.06¾	.06½	.06⅝	.05⅞	.06
NORTH LOUISIANA—						
Grade AA, 80-87, 375 e.p., rec. 90%	.07	.07¼	.06¾	.07	.06¾	
Grade BB, 84-92, 375 e.p., rec. 85%	.06⅞	.07⅛	.06⅜	.06½	.06¼	.06⅜
Grade C, 80-90, 375 e.p., rec. 78%	.06⅞	.07⅛	.06⅜	.06⅝	.06¼	.06¾
CALIFORNIA—						
75-78 375-390 endpoint	.08¾	.09¼	.08¾	.09¼	.08¾	.09¼
CHICAGO DISTRICT (Based on Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.06¾	.07	.06½	.06⅝	.06¼	.06⅜
Grade AA, 80-87.9, 375 e.p., rec. 90%	.06¾	.07	.06½	.06⅝	.06¼	.06⅜
Grade B, 76-83.9, 375 e.p., rec. 85%	.06¾		.06½	.06⅝	.05¾	.06
Grade BB, 84-92, 375 e.p., rec. 85%	.06¾		.06½	.06⅝	.05¾	.06
Grade C, 80-90, 375 e.p., rec. 78%	.06¾		.06½	.06⅝	.05¾	.06

BURNING OIL

OKLAHOMA (Group 3)—	Aug. 27		Aug. 20		Aug. 13	
41-43 water white kerosene	.05½	.05¾	.05¼	.05⅝	.05⅛	.05½
42-44 water white kerosene	.06	.06¼	.05¾	.06⅛	.05¾	.06
***NORTH LOUISIANA—**						
41-43 water white kerosene	.05¾	.06	.05¾		.05¾	
NORTH TEXAS—						
41-43 water white kerosene	.05¼	.05⅜	.05	.05⅛	.05	.05⅛
40-42 water white kerosene	.05	.05⅛	.04¾	.05	.04¾	.05
***ARKANSAS—**						
41-43 water white kerosene	.05¾	.06	.05¾		.05¾	
PENNSYLVANIA—						
43 Kerosene prime white	.05¾	.06	.05¾	.06	.05¾	.06
45 Kerosene water white	.06	.06¼	.06	.06⅛	.06	.06⅛
46 Kerosene water white	.06½	.06¾	.06¼	.06½	.06¼	.06½
47 Kerosene water white	.06¾	.07	.06½	.06¾	.06½	.06¾
300 Mineral Seal	.06½	.07	.06¾	.07	.06¾	.07
CALIFORNIA—						
38-40 water white Kero. (high-burning test)	.05½	.06	.05½	.06	.05½	.06
Engine distillate, 43-44. 445 endpoint	.08	.08¾	.08	.08¾	.08	.08¾
Engine Distillate, 42-44, 480 endpoint	.07½	.08¼	.07½	.08¼	.07½	.08¼
CHICAGO DISTRICT (Based on Group 3)—						
41-43 water white kerosene	.05½	.05¾	.05¼	.05½	.05¼	.05½
42-44 water white kerosene	.05¾	.06	.05½	.05⅞	.05½	.05¾
GULF COAST (Export)—						
41-43 prime white	.07		.07		.07	
41-43 water white	.08		.08		.08	

*Louisiana, Arkansas, Mississippi and East Texas delivery.

FUEL OIL

OKLAHOMA (Group 3)—	Aug. 27		Aug. 20		Aug. 13	
Below 18 Fuel Oil, per bbl.	.45	.50	.40	.50	.45	.50
18-22 Fuel Oil, per bbl.	.50	.55	.50	.55	.50	.50
20-22 Fuel Oil, per bbl.	.55	.60	.55	.60	.55	.60
22-26 Fuel Oil, per bbl.	.65	.70	.62½	.67½	.62½	.67½
24-26 Fuel Oil, per bbl.	.72½	.77½	.70	.75	.70	.75
26-30 Fuel Oil, per bbl.	.80	.85	.80	.85	.80	.85
28-30 Fuel Oil, per bbl. (industrial)	.85	.90	.85	.90	.85	.90
32-36 Gas Oil (industrial)	.02½	.02⅝	.02½	.02⅝	.02½	.02⅝
32-36 Gas Oil (straw color)	.02⅝	.02⅞	.02⅝	.02⅞	.02⅝	.02⅞
36-38 Distillate	.03⅜	.03⅝	.03¼	.03⅜	.03¼	.03⅜
38-40 Straw Distillate	.03⅝	.03⅞	.03½	.03¾	.03½	.03¾
NORTH TEXAS—						
Below 20 Fuel Oil	.60	.65	.60	.65	.60	.65
24-26 Fuel Oil, per bbl.	.65	.70	.65	.70	.65	.70
32-36 Gas Oil (straw)	.02⅝	.02¾	.02⅝	.02¾	.02⅝	.02¾
38-40 Straw Distillate	.03½	.03¾	.03⅝	.03⅝	.03⅝	.03⅝
***NORTH LOUISIANA—**						
18-20 Fuel Oil, per bbl.	.75		.75		.75	
30-32 Gas Oil	.02¾	.03	.02¾	.03	.02¾	.03
***ARKANSAS—**						
33-36 Distillate	.03	.03¼	.03	.03¼	.03	.03¼
30-32 Gas Oil	.02¾	.03	.02¾	.03	.02¾	.03
16-22 Refinery Fuel Oil, per bbl.	.75		.75		.75	
GULF COAST (South Texas)—						
Gas Oil	.03¾	.04	.03¾	.04	.04	
Bunker C Fuel (cargo lots), per bbl.	.70	.80	.70	.80	.70	.80
Bunker C Fuel (small lots)	.95	1.00	.95	1.00	.95	1.00
PENNSYLVANIA—						
30-34 Fuel Oil	.04	.04¼	.04	.04¼	.04⅛	.04¼
36-40 Fuel Oil	.04¼	.04⅜	.04¼	.04⅜	.04⅜	.04½
CALIFORNIA—						
33-36 Distillate	.04	.04½	.04	.04½	.04	.04½
26-32 Distillate	.03	.03½	.03	.03½	.03	.03½
15-20 Fuel Oil, Bunker (at tide water)	.65	.85	.65	.85	.65	.85
15-20 Fuel Oil (cargo lots), per bbl.	.70	.85	.70	.85	.70	.85
27 plus Diesel, per bbl.	.90	1.05	.90	1.05	.90	1.05
CHICAGO DISTRICT (Based on Group 3)—						
22-26 Fuel Oil, per bbl.	.62½	.70	.62½	.67½	.62½	.67½
18-22 Fuel Oil, per bbl.	.52½	.57½	.50	.55	.50	.55
28-30 Fuel Oil	.90	.95	.90	.95	.90	.95
32-36 Gas Oil (zero)	.02⅝	.02¾	.02⅝	.02¾	.02⅝	.02¾
32-36 Gas Oil (industrial)	.02½	.02⅝	.02½	.02⅝	.02½	.02⅝
36-38 Distillate	.03¼	.03⅜	.03¾	.03⅜	.03¾	.03⅜
38-40 Straw Distillate	.03⅜	.03⅝	.03⅜	.03⅝	.03⅜	.03⅝

*Louisiana, Arkansas, Mississippi and East Texas delivery.

LUBRICATING OIL AND WAX

OKLAHOMA (Group 3)—	Aug. 27		Aug. 20		Aug. 13	
100 vis, 2 color, 20-25 cold test	.06¾	.07	.06¾	.07	.06¾	.07
100 vis., 3 color, 20-25 cold test	.05¾	.06	.05¾	.06	.05¾	.06
150 vis., 3 color, 20-25 cold test	.07¾	.08	.07¾	.08	.07¾	.08
150 vis., 4 color, 20-25-cold test	.07¼	.07½	.07¼	.07½	.07¼	.07½
180 vis., 3 color, 23-28 cold test	.09¼	.09½	.09¼	.09½	.09¼	.09½
180 vis., 5 color, 23-28 cold test	.08½	.08¾	.08½	.08¾	.08½	.08¾
200 vis., 3 color, 23-28 cold test	.09¾	.10	.09¾	.10	.09¾	.10
200 vis., 4 color, 23-28 cold test	.09¼	.09½	.09¼	.09½	.09¼	.09½
200 vis., 5 color, 23-28 cold test	.08¾	.09	.08¾	.09	.08¾	.09
240 vis., 3 color, 25-30 cold test	.13¼	.13½	.13¼	.13½	.13¼	.13¼
240 vis., 4 color, 25-30 cold test	.12¼	.12½	.12¼	.12½	.12¼	.12½
240 vis., 5 color, 25-30 cold test	.11¾	.12	.11¾	.12	.11¾	.12
280 vis., 3 color, 25-30 cold test	.15¾	.16	.15¾	.16	.15¾	.16
280 vis., 4 color, 25-30 cold test	.14¾	.15	.14¾	.15	.14¾	.15
280 vis., 5 color, 25-30 cold test	.13¾	.14	.13¾	.14	.13¾	.14
Cylinder Stocks:						
600, steam refined, light green	.12	.14	.12	.14	.14	.16
600, steam refined, dark green	.11	.13	.11	.13	.13	.14
190-200 vis., D color Bright Stock	.40	.41	.40		.40	
150-160 vis., D color Bright Stock	.36	.37	.35	.36	.35	.36
150-160 vis., E color Bright Stock	.30	.33	.33		.33	
Waxes:						
124-126 White Crude Scale Wax	.02⅝	.02¾	.02⅝	.02¾	.02⅝	.02¾
PENNSYLVANIA—						
34 Neutral	.07½	.07¾	.07½	.07¾	.07½	.07¾
34 Sundebloom	.07½	.07¾	.07½	.07¾	.07½	.07¾
36 Miners' Neutral	.07¼	.07½	.07¼	.07½	.07¼	.07½
150, 3 color	.18½	.19	.18½	.19	.18½	.19
180, 3 color	.23	.23½	.25	.25½	.25	.25½
200, 3 color	.25	.25½	.25	.25½	.25½	.26
220, 3 color	.28½	.29	.28½	.29	.28½	.29
600, steam refined	.23	.23½	.23	.23½	.24½	.25
635, steam refined	.25½	.26	.25½	.26	.28	.28½
650, steam refined	.28½	.29	.28½	.29	.29	.29½
600, Pennsylvania Flash	.30	.30½	.30	.30½	.30	.31
630, Pennsylvania Flash	.35	.35½	.35	.35½	.37	.37½
600, E filtered	.32	.32½	.32	.32½	.33	.33½
600, D filtered	.36	.37	.36	.37	.36	.37
Pennsylvania Bright Stock	.51	.51½	.51	.51½	.51	.51½
*122-124 White Crude Scale Wax	.02¾	.03	.02¾	.03	.02¼	.02⅞
*124-126 White Crude Scale Wax	.03	.03⅛	.03	.03⅛	.02⅞	.03
GULF COAST (South Texas)—						
No. 2 color, 100 vis., pale oil	.05¾	.06½	.05¾	.06½	.05¾	.06½
No. 3 color, 200 vis., pale oil	.09	.09½	.09	.09½	.09	.09½
No. 3 color. 300 vis., pale oil	.09¾	.10¼	.09¾	.10¼	.09¾	.10¼
No. 3½ color, 500 vis., pale oil	.11½	.12	.11½	.12	.11½	.12
No. 4 color, 750 vis., pale oil	.12½	.13	.12½	.13	.12½	.13
No. 5 to 6 color, 200 vis., red oil	.08	.08½	.08	.08½	.08	.08½
No. 5 to 6 color, 300 vis., red oil	.08¾	.09¼	.08¾	.09¼	.08¾	.09¼

*At New York.

REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.

No. 5 to 6 color, 500 vis., red oil	.09½	.10	.09½	.10	.09½	.10
No. 5 to 6 color, 750 vis., red oil	.11¾	.12¼	.11¾	.12¼	.11¾	.12¼
No. 2½ color, 200 vis., pale filtered	.11	.12	.11	.12	.11	.12
No. 2½ color, 300 vis., pale filtered	.12	.13	.12	.13	.12	.13
No. 2½ color, 500 vis., pale filtered	.14½	.15	.14½	.15	.14½	.15
No. 2½-3 color, 750 vis., pale filtered	.17	.19	.17	.19	.17	.19
CALIFORNIA—						
130 vis., 2½-3 color	.10¼	.10½	.10¼	.10½	.10¼	.10½
200 vis., 2½-3 color	.11½	.11¾	.11½	.11¾	.11½	.11¾
300 vis., 3-3½ color	.13	.13½	.13	.13½	.13	.13½
350 vis., 3½-4 color	.13½	.13¾	.13½	.13¾	.13½	.13¾
400 vis., 3½-4 color	.15	.15½	.15	.15½	.15	.15½
Red Neutral:						
200 vis., 4½-5 color	.11	.11¼	.11	.11¼	.11	.11¼
300 vis., 5-6 color	.12	.12¼	.12	.12¼	.12	.12¼
400 vis., 5-6 color	.13¼	.14	.13¼	.14	.13¼	.14
500 vis., 4½-5 color	.14¼	.15½	.14¼	.15½	.14¼	.15½
500 vis., 5-6½ color	.15	.15¼	.15	.15¼	.15	.15¼
600 vis., 6½ plus color	.16	.16¼	.16	.16¼	.16	.16¼

Note—Bright stocks are not manufactured commercially on the Pacific Coast.

NEW YORK (BAYONNE) REFINERY PRICES

	Aug. 27		Aug. 20		Aug. 13	
Gasoline, U. S. Motor, 58-60, 437	.09½	.10	.09½	.10	.09½	.10
Kerosene, water white, 41-43	.07¾	.08	.07¾	.08	.07¾	.08
*Fuel Oil, Bunker "C," 14-16, per bbl.	1.05		1.05		1.05	
†Fuel Oil, Diesel, 28-30, per bbl.	2.00		2.00		2.00	
Gas Oil, 32-36 gravity	.05¼		.05¼		.05¼	
25 pale Paraffin Oil	.10½		.10½		.10½	
28 pale Paraffin Oil	.07¼		.07¼		.07¼	
285 red Paraffin Oil	.11½		.11½		.11½	
250 red Paraffin Oil	.11		.11		.11	
225 red Paraffin Oil	.09½		.09½		.09½	
200 red Paraffin Oil	.09		.09		.09	
Refined Wax:						
120-122 a.m.p., per lb.	.03¾		.03½		.03½	
125-127 a.m.p., per lb.	.04		.039		.04	
130-132 a.m.p., per lb.	.05¼		.05¼		.04¾	
133-135 a.m.p., per lb.	.05⅞		.05¾		.06	
135-137 a.m.p., per lb.	.06		.05⅞		.06⅛	
Petrolatum in barrels, carload lots, per pound:						
Dark green	.019		.019		.019	
Amber	.03⅝		.03⅝		.03⅝	
Extra amber	.03⅞		.03⅞		.03⅞	
Cream	.06⅜		.06⅜		.06⅜	
Lily White	.07⅜		.07⅜		.07⅜	
Snow White	.08⅜		.08⅜		.08⅜	

*Lighterage 5.0 cents a barrel extra. †Lighterage 6.5 cents a barrel extra.

NEW YORK (BAYONNE) EXPORT PRICES

	Aug. 27	Aug. 20	Aug. 13	
Kerosene, prime white	.08	.08	.08	
Kerosene, water white	.09	.09	.09	
600, steam refined cylinder stocks, in bbls.	.31½	.32	.31	.34
635, steam refined	.33½	.34	.33	.36
650, steam refined	.37½	.38	.37	.40
600, Pennsylvania Flash	.43	.44	.43	.44
630, Pennsylvania Flash	.47	.48	.47	.49
600, Warren E	.40	.41	.40	
600, Oil City E	.39	.40	.39	
Light 140-150 Bright Stocks	.60	.61	.60	
Dark 140-150 Bright Stocks	.58	.59	.58	.59

LOS ANGELES EXPORT PRICES

	Aug. 27		Aug. 20		Aug. 13	
Kerosene, water white	.05	.05½	.05	.05½	.05	.05½
U. S. Motor Gasoline, 53-55 437 e.p.	.07	.07½	.07	.07½	.07	.07½

CRUDE OIL PRICES

OKLAHOMA, KANSAS, NORTH AND EAST CENTRAL TEXAS

Corsicana heavy (January 11)* ..... .80
Other fields .....See gravity table

*Posted by Magnolia Petroleum Co.

TEXAS PANHANDLE

Gray County, Wheeler County and Carson-Hutchinson Counties—See gravity table.

WEST TEXAS

Iatan* .....Same as North Texas
Crane-Upton-Crockett, Pecos, Winkler, Mitchell, and Glasscock (See gravity table).
Chalk† ..... .65

*Includes Howard County and Westbrook Fields.
†Posted by Humble Oil & Refining Co.

ARKANSAS-NORTH LOUISIANA

Smackover, below 24 gravity (May 20, 1929) .....$ .85
Smackover, 24 gravity and above (May 20, 1929) 1.00
Cotton Valley (Below 36 gravity May 22) ..... .85
Bellevue (May 29, 1929) 1.30
Urania (May 21, 1929) 1.10
East El Dorado (May 22, 1929) ..... .85
Other fields.....See gravity table

Cotton Valley crude above 36 gravity takes same gravity price schedule as shown for North Louisiana and Arkansas crude in Mid-Continent gravity price table.

Note—Smackover, Cotton Valley and Bellevue posted by Standard Oil Co. of Louisiana, and Magnolia Petroleum Co.; Urania posted by Louisiana Oil Refining Corp.; East El Dorado, Magnolia Petroleum Co.

GULF COAST

Grade A (May 20)* $1.30
Grade B .....See gravity table
Jennings, La. (March 14)† 1.05
Saratoga, Batson, Dayton (March 14, 1927)‡ 1.20
Markham (March 14)‖ 1.00
High Island (December 14)‖ 1.00

*Humble Oil & Refining Co., The Texas Company, Gulf Pipe Line Co., and Sun Pipe Line Co. †Gulf Pipe Line Co. ‡Sun Pipe Line Co. §The Texas Company.
‖Posted by Gulf Pipe Line Co.

ROCKY MOUNTAIN STATES
Ohio Oil Co.-Midwest Refining Co.
(Effective May 21, 1929)

Rock Creek, Wyo. $1.40
Salt Creek .....See gravity table
Big Muddy 1.43
Grass Creek, heavy (July 27, 1928) ... .90
Grass Creek, light 1.65
Mule Creek 1.20
Elk Basin 1.65
Lance Creek 1.68
Poison Spider (March 14, 1927) 1.00
Notches (March 14, 1927) ..... .65
Rex Lake (February 22) 1.10
Osage 1.65
Lost Soldier (contract, May 22) 1.05
Hamilton Dome (March 14, 1927) ..... .85
Pedro 1.25
Greybull 1.65
Four Bear ..... .85
Cat Creek (Montana) (July 27, 1928).. 1.48
Sunburst (Montana) (May 23, 1929) ... 1.75
Torchlight 1.65
Hogback (New Mexico) 1.70

Note—Salt Creek, Osage, Cat Creek, Greybull and Hogback posted by Midwest Re-

(Continued on Page 354)

CRUDE OIL GRAVITY TABLE

Gravity—	Okla., Kans., N. C. Texas 1	No. La and Arkansas 2	Crane, Upton, Crockett, Winkler, Howard, Pecos, Texas crudes, and Lea, N. Mex. 3	Stephens, Ark. 4	Wheeler (Texas Panhandle) 5	Gray County (Texas Panhandle) 6	Carson and Hutchinson (Texas Panhandle) 7	Salt Creek, Wyo. 8	Grade B and Light Crude (G. Coast) 9	Somerset (South Central Texas) 10
24 and above	....	....	....	....	....	....	....	....	....	....
Below 24	....	....	....	....	....	....	....	....	....	....
Below 25	.85	....	.70	....	....	....	....	....	1.15	....
25 to 25.9	.90	....	.74	....	....	....	....	....	1.18	....
26 to 26.9	.95	....	.78	....	....	....	....	....	1.21	....
27 to 27.9	1.00	....	.82	....	....	....	....	....	1.24	....
Below 28	....	1.00	....	.90	.90	.90	.90	....	....	....
28 to 28.9	1.05	1.05	.86	.94	.90	.90	.90	....	1.27	....
29 to 29.9	1.10	1.10	.90	.98	.90	.95	.90	1.10	1.30	....
30 to 30.9	1.15	1.15	.95	1.02	.95	1.00	.90	1.15	1.32	....
31 to 31.9	1.20	1.20	.98	1.06	1.00	1.05	.90	1.20	1.36	....
32 to 32.9	1.25	1.25	1.02	1.10	1.05	1.10	.95	1.25	1.39	1.05
33 to 33.9	1.30	1.30	1.06	....	1.10	1.15	1.00	1.30	1.42	1.07
34 to 34.9	1.35	1.35	1.10	....	1.15	1.20	1.05	1.35	1.45	1.09
35 to 35.9	1.40	1.40	1.14	....	1.20	1.25	1.10	1.40	1.48	1.11
36 to 36.9	1.45	1.45	1.18	....	1.25	1.30	1.15	1.45	....	1.13
37 to 37.9	1.50	1.50	....	....	1.30	1.35	1.20	1.50	....	1.15
38 to 38.9	1.55	1.55	....	....	1.35	1.40	1.25	....	....	1.17
39 to 39.9	1.60	1.60	....	....	1.40	1.45	1.30	....	....	....
40 to 40.9	1.65	1.65	....	....	1.45	1.50	1.35	....	....	....
41 to 41.9	1.70	1.70	....	....	1.50	1.55	1.40	....	....	....
42 to 42.9	1.75	1.75	....	....	1.55	1.60	1.45	....	....	....
43 to 43.9	1.80	1.80	....	....	1.60	1.65	1.50	....	....	....
44 and above	1.85	1.85	....	....	1.65	1.70	1.55	....	....	....

Column 1, Note—Magnolia Petroleum Co. posted schedule May 20, 1929, making price below 26 gravity 70 cents per barrel, 26-26.9 gravity 75 cents, 27-27.9 gravity 85 cents, 28-28.9 gravity 90 cents, 29-29.9 gravity 95 cents, 30-30.9 gravity $1.05, and 31-31.9 gravity $1.15, with balance of the price schedule as shown above.

Oklahoma—Carter Oil Co., Prairie Oil & Gas Co., Sinclair Oil & Gas Co., Gypsy Oil Co., The Texas Company, May 20.

North Central Texas—Including Ranger, Mexia, Powell, Richland, Wortham, Lytton Springs, Currie, Nocona and Moran, Prairie Oil & Gas Co., Sinclair Oil Refining Co., Humble Oil & Refining Co., The Texas Company and Gulf Refining Co., May 20

Kansas—Prairie, Sinclair, The Texas Company and Carter, May 20.

Column 2—Arkansas and North Louisiana—(Caddo, Bull Bayou, Crichton, Cotton Valley, above 36 gravity, DeSoto, Haynesville, Homer and El Dorado only) May 22, Standard Oil Co. of Louisiana, Louisiana Oil Refining Co., Gulf Refining Co., Magnolia Petroleum Co., schedule applies to Pine Island, Haynesville, Bull Bayou, Louisiana and El Dorado, Ark., light crude.

Column 3—Humble Oil & Refining Co. and Magnolia Petroleum Co., May 20.

Column 4—Atlantic Oil Producing Co., Prairie Oil & Gas Co., Louisiana Oil Refining Corp., May 21, 1929.

Columns 5, 6 and 7—Humble Oil & Refining Co., Magnolia Petroleum Co., May 20, 1929.

Column 8—Midwest Refining Co., May 20, 1929. All crude over 37 gravity $1.50 per barrel.

Column 9—Humble Oil & Refining Co., May 20, 1929, (schedule ends 35 and above.)

Column 10—Grayburg Pipe Line Co. and Pioneer Oil & Refining Co., April 7.

CALIFORNIA CRUDE OIL PRICES

Standard Oil Co.-Union Oil Co. (Effective January 18, 1929

Gravity—	Salt Lake, Potrero, Newport, Long Beach, Summerland, Lawndale, Los Angeles, Fullerton, Richfield, Torrance, Olinda-Brea, Alamitos Heights, Signal Hill, Seal Beach, Huntington Beach, Inglewood, Rosecrans-Dominguez, Watsonville 1	Whittier, La Habra, Coyote Hills 2	Midway-Sunset, Elk Hills, Lost Hills, Belridge, Buena Vista Hills 3	Montebello 4	Santa Fe Springs 5	Santa Maria Coalinga 6	Wheeler Ridge Fruitvale 7	Orcutt Ventura, Rincon 8	Ventura Ave. 9	Elwood Terrace 10
14 to 14.9	.70	.70	.50	.70	....	.50	.50	.65	.70	....
15 to 15.9	.70	.70	.50	.70	....	.50	.50	.65	.70	....
16 to 16.9	.70	.70	.50	.70	....	.50	.50	.65	.70	....
17 to 17.9	.70	.70	.50	.70	....	.50	.50	.65	.70	....
18 to 18.9	.75	.75	.56	.70	....	.56	.56	.70	.75	....
19 to 19.9	.80	.80	.62	.75	....	.62	.62	.70	.80	....
20 to 20.9	.85	.84	.68	.80	....	.68	.68	.70	.85	....
21 to 21.9	.89	.88	.74	.85	.89	.74	.74	.86	.86	....
22 to 22.9	.93	.91	.80	.90	.92	.80	.80	.87	.87	....
23 to 23.9	.97	.94	.85	.95	.95	.85	.85	.90	.90	....
24 to 24.9	1.01	.97	.90	.98	.98	.88	.88	.94	.94	....
25 to 25.9	1.05	1.00	.95	1.01	1.01	.91	.91	.98	.98	....
26 to 26.9	1.09	1.04	1.00	1.04	1.04	.94	.94	1.02	1.02	....
27 to 27.9	1.13	1.08	1.05	1.07	1.07	.98	.97	....	1.06	....
28 to 28.9	1.17	1.12	1.10	1.10	1.10	1.02	....	....	1.10	....
29 to 29.9	1.21	1.16	1.16	1.13	1.15	1.06	....	....	1.14	....
30 to 30.9	1.25	1.20	1.22	1.16	1.20	1.10	....	....	1.18	....
31 to 31.9	1.30	....	1.28	....	1.25	1.14	....	....	1.23	....
32 to 32.9	1.35	....	1.34	....	1.30	1.18	....	....	1.28	....
33 to 33.9	1.41	....	1.40	....	1.35	1.22	....	....	1.34	....
34 to 34.9	1.47	....	1.46	....	1.40	1.26	....	....	1.40	1.16
35 to 35.9	1.53	....	....	....	1.45	1.30	....	....	1.46	1.22
36 to 36.9	1.59	....	....	....	1.50	....	....	....	1.52	1.28
37 to 37.9	1.65	....	....	....	1.55	....	....	....	1.58	1.34
38 to 38.9	1.71	....	....	....	1.60	....	....	....	1.64	1.40
39 to 39.9	1.77	....	....	....	1.65	....	....	....	1.70	1.46
40 to 40.9	1.83	....	....	....	....	....	....	....	1.76	1.53
41 to 41.9	1.89	....	....	....	....	....	....	....	1.82	1.58
42 to 42.9	1.95	....	....	....	....	....	....	....	1.88	1.64

Kern River, Newhall-McKittrick, Mount Poso and Round Mountain 11 to 13.9 gravity 45 cents, 14 gravity and above 50 cents, effective October 2, 1929. On December 1, 1928, the Union Oil Co. posted Midway-Sunset, Elk Hills, Buena Vista, Lost Hills and Coalinga crude as follows: 11 to 13.9 gravity at 45 cents, 14 gravity and above 50 cents.

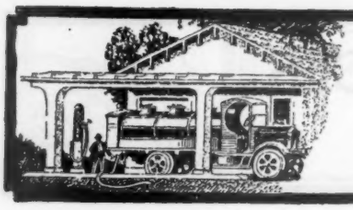
Column 1—Signal Hill, Seal Beach, Huntington Beach and Alamitos Heights crude, 14 to 32.9 gravity, inclusive; Richfield, Olinda-Brea and Fullerton, 14 to 30.9 gravity; Torrance and Inglewood, 14 to 28.9 gravity; Domingues and Athens-Rosecrans, 24 to 42.9 gravity.

Column 2—Whittier crude, 14 to 22.9 gravity; Coyote Hills, 14 to 30.9 gravity.

Column 3—Kern River, Newhall and McKittrick, 11 to 19.9 gravity; Midway-Sunset, Buena Vista and Elk Hills, 11 to 33.9 gravity; Lost Hills, 11 to 34.9 gravity, oil below 14 gravity posted at 45 cents.

Column 6—Oil below 14 gravity posted at 45 cents.

Columns 8 and 9—Posted by Union Oil Co. only.



TANK WAGON MARKETS

Tank wagon quotations for gasoline and kerosene in United States as furnished by the larger marketing concerns Aug. 27.

ALL TANK WAGON AND SERVICE STATION QUOTATIONS INCLUDE TAXES

STANDARD OIL CO. (INDIANA)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Chicago dist.†..	19.0	20 0	3.0	13.0
Decatur, Ill. ...	19.2	20.2	3.0	13.1
E. St. Louis ...	18.4	17.4	3.0	12.2
Joliet	19.4	20.4	3.0	13.3
Peoria	19.2	20.2	3.0	13.1
Quincy	19.2	20.2	3.0	12.9
Davenport, Ia..	19.5	20.5	3.0	13.3
Des Moines ...	19.5	20.5	3.0	13.3
Keokuk	19.5	20.5	3.0	13.3
Sioux City	19.1	20.1	3.0	12.9
Duluth, Minn..	20.5	21.5	3.0	13.9
Mankato	20.1	21.1	3.0	13.7
Minneapolis ...	20.2	21.2	3.0	13.9
LaCrosse, Wis..	19.2	20.2	2.0	14.0
Milwaukee	18.1	19.1	2.0	12.9
Madison	17.3	18.3	2.0	12.1
Detroit, Mich...	19.8	20.8	3.0	14.7
Grand Rapids..	19.7	20.7	3.0	14.6
Saginaw	19.9	20.9	3.0	14.8
Evansville, Ind.	20.0	21.0	4.0	14.0
Fort Wayne ...	20.4	21.4	4.0	14.4
Indianapolis ..	20.2	21.2	4.0	14.2
South Bend ...	20.4	21.4	4.0	14.4
Fargo, N. D. ..	21.9	22.9	3.0	15.9
Huron, S. D. ..	21.3	22.3	4.0	14.7
Sioux Falls	20.1	21.1	4.0	14.4
K. C., Mo.* ...	18.9	19.9	3.0	11.6
Springfield* ...	18.8	19.8	3.0	12.5
St. Louis*	17.9	18.9	2.5	12.3
St. Joseph	18.5	19.5	2.0	12.0
Wichita, Kans..	17.8	18.8	3.0	11.8
Bartlesville, Ok.	18.5	19.5	4.0	11.5

*State tax 2 cents; remainder city tax.
†Effective February 20, discounts on Q.D.A. in Chicago district 2 cents off service station price on purchases of 500 gallons or more per month and 4 cents on purchases of 1,000 gallons or more per month.

NAPHTHA

	Tank wagon	Tank car
Oleum spirits	15.7	12.9
V. M. & P. Naphtha	17.2	13.9
Cleaner's naphtha	17.0	14.9
Stanisol	18.0	15.4

Tank wagon prices f.o.b. Chicago; tank car prices f.o.b. Whiting.

STANOLIND FURNACE OIL IN CHICAGO

Less than 100 gallons	9.0
100 to 799 gallons	8.0
800 gallons or more	7.5

Note—Outside Chicago furnace oil discount of 1 cent per gallon is given on deliveries of 100 to 349 gallons and 1½ cents on deliveries of 350 gallons or more.

The following quantity discounts from the service station price are allowed on monthly sales of gasoline; 2,000 gallons or less, 2 cents; more than 2,000 and less than 6,000 gallons, 2½ cents; more than 6,000 gallons, 3 cents. Discounts are allowed each month, and they are not cumulative. Delivery tickets showing date and quantity delivered must be sent to the seller before the tenth of the month to secure the discount on the previous month's purchases.

SOUTHWESTERN DISTRICT

Magnolia Petroleum Co.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Dallas, Tex. ...	17.0	21.0	4.0	13.0
Fort Worth ...	17.0	20.0	4.0	12.0
Houston	17.0	21.0	4.0	11.0
San Antonio ...	17 0	21 0	4.0	11.0
El Paso	16.0	19.0	4.0	16.0
Texarkana	17.0	19.0	4.0	12.0
Muskogee, Ok.*	17.0	20.0	4.0	13.0
Okla. City* ...	17.0	20.0	4.0	10.0
Tulsa*	15.0	19.0	4.0	10.0
Ft. Smith, Ark.	15.0	17.0	5.0	12.0
Little Rock ...	19.0	23.0	5.0	13.0

*Gasoline tank wagon price to dealers 2 cents under posted tank wagon.

ROCKY MOUNTAIN DISTRICT

Continental Oil Co.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Denver, Colo...	18.0	21.0	4.0	15.5
Pueblo	18.0	21.0	4.0	15.5
Grand Junction	22.5	25.5	4.0	19.0
Casper, Wyo. ..	21.0	24.0	4.0	14.0
Cheyenne	22.0	25.0	4.0	15.5
Butte, Mont. ..	25.5	28.5	5.0	20.0
Helena	25.5	28.5	5.0	20.0
Salt Lake, Utah	22.0	25.0	3.5	17.0
Albu'que, N. M.	21.0	24.0	5.0	17.0
Boise, Idaho ..	24.5	27.5	4.0	19.0
Twin Falls	24.5	28.5	4.0	19.0

PENNSYLVANIA—DELAWARE AND PART NEW ENGLAND

The Atlantic Refining Co.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Pittsburgh, Pa..	17.0	*23.0	...	14.0
Philadelphia ..	17.0	*23.0	...	14.0
Scranton	17.0	*23.0	...	14.0
Allentown	17.0	*23.0	...	14.0
Altoona	17.0	*23.0	...	14.0
Erie	14.0	*19.0	...	14.0
Dover, Del. ...	20.0	22.0	3.0	14.0
Wilmington	20.0	22.0	3.0	14.0
Springf'd, Mass.	18.0	20.0	2.0	15.0
Worcester	17.0	18.0	2.0	15.0
Boston	18.0	20.0	2.0	15.0
Providence, R.I.	16.0	17.0	2.0	15.0
Hartford, Conn.	18.0	20.0	2.0	14.0
New Haven ...	18.0	20.0	2.0	15.0

*Includes tax of 4.0 cents. Pennsylvania tax is collected by the dealer and paid by him direct to the State. The Atlantic Refining Co. recognizes a 2-cent per gallon discount on gasoline from its posted tank wagon markets on sales to dealers for purposes of resale. The Atlantic Refining Co. also recognizes a maximum discount of 2 cents per gallon on gasoline to commercial accounts under contract for one year.

NEW YORK AND PART OF NEW ENGLAND DISTRICT

Standard Oil Co. (New York)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Albany, N. Y...	18.0	20.0	2.0	15.0
New York* ...	19.0	21.0	2.0	15.0
Buffalo	18.0	20.0	2.0	14.0
Rochester	18.0	20.0	2.0	14.0
Syracuse	18.0	20.0	2.0	15.0
Boston, Mass...	18.0	20.0	2.0	15.0
Augusta, Me....	20.0	22.0	4.0	15.0
Manch't'r, N.H.	20.0	22.0	4.0	15.0
Burlington, Vt..	19.0	20.0	4.0	15.0

*Prices in steel barrels.

SOUTHERN DISTRICT

Standard Oil Co. (Kentucky)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Atlanta, Ga. ...	20.0	22.0	4.0	16.5
Augusta	20.0	22.0	4.0	15.5
Macon	21.0	23.0	4.0	16.5
Savannah	20.0	22.0	4.0	15.5
Birm'ham, Ala..	20.0	22.0	4.0	15.0
Mobile	20.0	22.0	4.0	15.0
Montgomery ...	21.0	23.0	4.0	16.5
Clarks'le, Miss..	20.0	22.0	5.0	13.5
Jackson	21.0	23.0	5.0	13.0
Natchez	20.5	22.5	5.0	14.0
Gulfport	22.5	24.5	5.0	14.0
Vicksburg	20.5	22.5	5.0	14.0
Jack'ville, Fla..	22.0	24 0	6.0	14.5
Miami	23.0	25.0	6.0	15.5
Pensacola	23.0	25.0	6.0	14.5
Tampa	22.0	24.0	5.0	15.5
Lexington, Ky..	20.0	22.0	5.0	15.5
Covington	21.0	22.0	5.0	15.5
Louisville	21.0	23.0	5.0	15.0
Ashland	18.0	19.0	5.0	15.5
Catlettsburg ..	18.0	19.0	5.0	15.5

In addition to the state tax of 4 cents on gasoline, Montgomery has city tax of 1 cent on gasoline and one-half cent on kerosene. Kerosene prices in Georgia include 1-cent tax. In Florida, an inspection fee of 0.125 cent; in Alabama, an inspection fee of one-half cent on kerosene and one-fortieth cent on gasoline. Pensacola and Mobile taxes include 1-cent city levy. Gulfport tax includes privilege tax of 3 cents in addition to state tax.

Effective April 2, price to dealers 2 cents under posted tank wagon price.

PACIFIC COAST TERRITORY

Standard Oil Co. (California)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
San Francisco.	20.0	24.0	3.0	15.5
Los Angeles ..	19.5	23.5	3.0	15.5
Reno, Nev.	24.0	26.0	4.0	19.0
Portland, Ore ..	20.5	24.5	3.0	16.5
Seattle, Wash..	19.5	23.5	3.0	16.5
Tacoma	19.5	23.5	3.0	16.5
Spokane	23.5	27.5	3.0	20.5
Phoenix, Ariz..	18.0	22.0	4.0	20.5

NEBRASKA

Standard Oil Co. (Nebraska)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Omaha	20.25	22.25	4.0	13.25
McCook	21.75	23.75	4.0	14.75
Norfolk	20.75	22.75	4.0	13.75
N. Platte	21.75	23.75	4.0	14.50
Scottsbluff	21.75	23.75	4.0	14.25

ATLANTIC COAST DISTRICT

Standard Oil Co. (New Jersey)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Atlantic City ..	14.0	18.0	2.0	13.0
Newark, N. J...	16.0	20.0	2.0	13.0
Annapolis, Md..	18.0	22.0	4.0	13.0
Baltimore	18.0	22.0	4.0	12.0
Cumberland	18.0	22.0	4.0	13.0
Washington ...	16.0	20.0	2.0	12.0
Danville, Va. ..	19.0	23.0	5.0	12.0
Norfolk	19.0	23.0	5.0	13.0
Petersburg	19.0	23.0	5.0	13.0
Roanoke	18.0	21.0	5.0	13.0
Richmond	19.0	23.0	5.0	13.0
Charles'n, W.Va.	18.0	22.0	4.0	13.0
Keyser	18.0	22.0	4.0	13.0
Parkersburg	18.0	22.0	4.0	13.0
Wheeling	18.0	22.0	4.0	13.0
Charlotte, N. C.	19.0	23.0	5.0	13.0
Hickory	19.0	23.0	5.0	13.0
Mt. Airy	19.0	23.0	5.0	13.0
Salisbury	17.0	20.0	5.0	13.0
Charleston, S.C.	20.0	24.0	6.0	13.0
Columbia	20.0	24.0	6.0	13.0

OHIO

Standard Oil Co. (Ohio)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Ohio points* ..	19.0	20.0	4.0	†13.0

*Dealers and commercial accounts 2 cents under tank wagon.
†Service station price 15 cents.

CENTRAL SOUTH DISTRICT

Standard Oil Co. (Louisiana)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
N. Orleans, La.*	16.5	20.5	5.0	16.0
Baton Rouge ..	16.0	20.0	4.0	14.5
Alexandria† ...	18.0	22.0	5.0	16.0
Lafayette†	18.0	22.0	5.0	14.0
Lake Charles†..	18.5	22.5	5.0	16.0
Shreveport	17.5	21.5	4.0	15.0
Knoxv'le, Tenn.	20.0	24.0	5.0	16.0
Memphis	18 0	22.0	5 0	12 5
Chattanooga ..	16.0	20.0	5.0	16.0
Nashville	19.0	23.0	5.0	16.0
Bristol	19.0	23.0	5.0	14.0
Lt. Rock, Ark..	19.0	23.0	5.0	13.0

*Tax of 5 cents includes city tax of 1 cent. Louisiana Kerosene prices include 1-cent state tax and 1-cent parish tax.
†Includes 1-cent parish tax.

TANK WAGON CHANGES

August 3. Standard Oil Co. of Kentucky reduced the gasoline tank wagon price 1 cent in Lexington, Ky., to 20 cents.

August 15. Standard Oil Co. of Louisiana reduced the gasoline tank wagon and station prices 2 cents in Chattanooga, Tenn., to 18 cents and 22 cents.

August 16. Standard Oil Co. of Louisiana reduced the gasoline station price 2 cents in Chattanooga, Tenn., to 20 cents.

August 23. Standard Oil Co. of Louisiana reduced the gasoline tank wagon price 2 cents in Chattanooga, Tenn., to 16 cents.

August 24. Magnolia Petroleum Co. reduced the gasoline tank wagon price 1 cent and the station price 2 cents in El Paso, Tex., to 16 cents and 19 cents.

BUYS EASTERN JOBBER

NEW YORK, Aug. 26.—Richfield Oil Corp. of New York has purchased a controlling interest in the Lamson Oil Co., operating a chain of 20 service stations at Providence, R. I., and vicinity. The deal is reported to involve $175 000, the Lamson company being capitalized at $250,000.

Richfield products will be marketed through the Lamson chain in Rhode Island and Massachusetts, and will add about 4,000,000 gallons per year to the Richfield gasoline business in the East.

A 260,000-bbl. gasoline bulk storage plant, to be located on the water front, will be established at Providence by the Richfield Oil Corp. of New York.

TO START REFINERY

CHICAGO, Aug. 24.—The Taxman Refining Co., with its plant at Wichita Falls, Tex., reports that it has made a contract to receive 2.000 bbls. of crude oil daily for two years. The crude will come from the Wichita Falls district. The refinery is at present scheduled to begin operations during the current week. The Taxman Refining Co. is now making additional contracts on gasoline over one and two-year periods for shipment out of the North Texas district.

ERECT OFFICE BUILDING

The Barnsdall Refineries, Inc., is building an office building at its Barnsdall, Okla., refinery. The building will house the administration offices for the Barnsdall refinery and also the plant laboratory.

The Barnsdall company is also carrying on an improvement program at its Wichita, Kans., refinery. New reaction chambers for the cracking equipment are included in the improvements.

CRUDE OIL PRICES

(Continued from Page 353)

fining Co., and the remainder by the Ohio Oil Co. Both companies post Grass Creek light and Elk Basin.

SOUTH CENTRAL AND SOUTH-WESTERN TEXAS

Luling (May 2)*	$ .90
Mirando (May 20, 1929)†	.90
Salt Flat (May 20, 1929)§	1.25
Rockdale-Minerva (April 15): ..	
Below 28 gravity	1.25
28-38.9 gravity	1.27
39-39.9 gravity	1.29
40 and above	1.31
Thrall‡	...
Callihan (May 15)	1.75
Lytton Springs (Lockhart)	See gravity table
Somerset	See gravity table

*Posted by Magnolia Petroleum Co.
†Magnolia Petroleum Co., Humble Oil & Refining Co., Crown Central Pipe Line Co.
‡Thrall prices same as North Central Texas less 19½ cents per cwt. freight.
§Humble Oil & Refining Co.

EASTERN STATES

Joseph Seep Purchasing Agency
(Effective August 16, 1929)

Penna Grade Oil in New York Transit Lines (New York)	$3.30
Bradford District Oil in National Transit Lines (Pennsylvania)	3.30
Penna Grade Oil in National Transit Lines (Pennsylvania)	3.30
Penna Crude Oil in Southwest Pennsylvania Lines (West Virginia)	3.25
Penna Grade Oil in Eureka Pipe Line Lines (Pennsylvania)	3.15
Penna Grade Oil in Buckeye Pipe Line Lines (Ohio)	2.90
Cabell Grade Oil in Eureka Pipe Line Lines (West Virginia) (May 22, 1929)	1.75
Corning 35-cent Grade Oil in Buckeye Pipe Line Co.'s Line (May 22, 1929).	1.80
Corning 25-cent Grade Oil in Buckeye Pipe Line Co.'s Lines (May 22, 1929).	1.90
Somerset Oil in Cumberland Pipe Line Lines (Kentucky) (May 22, 1929) ...	1.80
Ragland Grade Oil in Cumberland Pipe Line Lines (Kentucky) (Jan. 29) ...	.60

MIDDLE WESTERN STATES

Ohio Oil Co.
(Effective May 21, 1929)

Lima	$1.80
Wooster	1.90
Illinois	1.75
Indiana	1.57
Princeton	1.75
Plymouth	1.28
Waterloo (November 17, 1926)	1.35
Western Kentucky	1.82
Dundee, Mich. (June 26, 1929)‖	1.25
Upper and Lower Traverse sands, Mich.‖	
....Same as Mid-Continent gravity scale	
Midland, Mich. (June 3, 1929)*	1.70
Saginaw, Mich., Saginaw Sand (February 10)†	1.89
Saginaw, Mich., Berea Sand (February 10)†	1.79
Cumberland, Clay, Barren, Clinton and Monroe Counties, Kentucky, (March 15)§	1.50
Oil in line in S.oil Oil Refining Co. in Oil City, Ky. (June 1, 1929)§	1.80
Oil Springs (Canada)¶	2.27
Petrolia (Canada)¶	2.30

*Poted by Pure Oil Co.
†Posted by Sun Oil Co.
‡Posted by Paragon Development Co.
§ osted by Stoll Oil Refining Co.
¶Posted by Imperial Oil Co., Ltd.
‖Posted by Standard of Indiana for boat shipment.

MEXICAN CRUDE

Panuco (May)*	$ .644

*Based on July transactions. Price exclusive of taxes.

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Oil Shares Hold Their Recent Gains

Action of Securities Market Credited to Earnings Reports and Expectation That New Conservation Law Will Improve Conditions

The oil shares, which recently began a strong upward movement, held their gains well the last week, as is shown by the fact that the 20 representative stocks used as a barometer by The Oil and Gas Journal, showed an average price of $60.61 in the closing quotations for last Saturday as compared with $60.32 the week before. Continued faith in the efficacy of the conservation law about to go into effect in California, excellent earning reports and persistent rumors of contemplated mergers among some of the larger oil companies are credited with the continued satisfactory action of the market in petroleum securities. Purchase of Standard of New York in large blocks prompted speculation as to probable development in that company

Sinclair Consolidated

Sinclair Consolidated Oil Corp. and subsidiaries report for six months ended June 30, 1929, gross earnings, including miscellaneous income, of $90,957,374, against $81,698,961 in first six months of 1928. After expenses, ordinary taxes, interest, etc., profit available for federal taxes and reserves was $16,449,250, comparing with $9,452,955 in first half of previous year. Consolidated income account for six months ended June 30, 1929, compares as follows:

	1929	1928
Gross earn.	$90,957,374	$81,698,961
Exp. main. ord. tax, etc.	71,324,265	68,577,107
Net earn.	$19,633,109	$13,121,854
Int. and disc.	3,183,859	3,668,898
Profit*	$16,449,250	$9,452,955

*Available for federal taxes, surplus, loss and reserves.

North Central Texas

North Central Texas Oil Co. declared regular quarterly dividend of $1.62½ on the preferred, payable October 1 to stock of record September 10.

Lion Oil Refining

Profit of Lion Oil Refining Co. for seven months ended July 31, 1929, was $712,750 after depreciation and depletion but before federal taxes, against $63,779 before federal taxes for corresponding period of previous year. July profit amounted to $210,463 before federal taxes. T. H. Barton, president, said, "Depreciation and depletion charged in first seven months of 1929 was $930,764 or more than double the amount charged off a year ago."

Louisville Gas & Electric

Louisville Gas & Electric Co. declared quarterly dividends of 43¾ cents on Class A and Class B common, both payable September 25 to stock of record August 31.

El Aguila Oil

El Aguila Oil Co., Mexican subsidiary of British Eagle Oil Co., reported loss of 318,399 pesos (approximately $159,199) during 1928. Gross profits during year were 4,816,159.15 pesos, and dividends, interest and other income totaled 3,562,-541.96 pesos, making total income 8,378,-801.11 pesos. A total of 8,697,200.12 pesos was charged to depreciation, leaving loss of 318,399 pesos. At the end of 1927, balance of 556,298.82 pesos was on hand. Balance carried over at the beginning of 1929 was 237,899.81 pesos.

Continental Oil of Delaware

Report of Continental Oil Co. of Delaware, which is a consolidation of Continental Oil Co. of Maine and subsidiaries and Marland Oil Co. of Delaware and subsidiaries, for quarter ended June 30, 1929, shows consolidated profit of $3,842,081 after interest, depreciation, depletion, intangible drilling costs, surrendered leases, etc., but before federal taxes, comparing with net loss of $1,641,-555 in preceding quarter and profit of $654,004 in June quarter of 1928. For six months ended June 30, profit before federal taxes totaled $2,200,526 against net loss of $1,787,526 in first half of previous year. Stock outstanding amounts to 4,741,533 no-par shares.

Oklahoma Natural Gas

The Oklahoma Natural Gas Corp. reports that gross earnings for the six months ended June 30, amounted to $6,-714,289, compared with $6,161,465 for the first half of 1928, while net operating income after expenses and taxes was $3,378,569, against $2,927,866. Gross earnings for the year ended June 30 were $10,649,539, against $10,096,715 for the year ended December 31, 1928, and net operating income was $4,454,772 against $4,004,069.

Cities Service

Important expansion plans of the petroleum, natural gas and utility divisions of the Cities Service Co. are revealed in its report of earnings for July and for the 12 months ended on July 31. Net earnings for July were $3,423,683, the largest for any month in the company's history, bringing the total for the 12-month period to $37,961,996, also a high record.

Net earnings for the 12 months ended July 31 were 6.29 times interest and discount on its debentures. Net to stocks and reserves amounted to $31,933,692, or 4.71 times preferred stock dividends. This compares with $29,191,918, or 4.29 times, for the corresponding period a year before.

With the publication of its earnings statement, Cities Service Co. announced monthly dividends of 2½ cents in cash and one-half of 1 per cent in common stock on the new no par common stock, equivalent to one-half of 1 per cent in cash and one-half of 1 per cent in stock on the old $20 par value common stock. Regular monthly dividends of 50 cents on the preferred and preference BB stocks and 5 cents on the preference B stock were announced, all payable October 1 to stockholders of record September 15.

Chesebrough Manufacturing

Chesebrough Mfg. Co. has declared usual extra dividend of 50 cents and regular quarterly of $1 on common, payable September 30 to stock of record September 10.

Standard Gas & Electric

Gross earnings of the Standard Gas & Electric Co. for the 12 months ended June 30 showed a gain of $6,762,236 over the corresponding period of 1928, it was announced yesterday. This increase represents an advance of somewhat over 4 per cent. based on gross earnings of $143,787,789 for the previous 12 months, compared with a gross of $150,550,025 for the year ended June 30 last.

The increase in the company's net income after ordinary taxes and other deductions appears to be even more impressive, amounting to somewhat over 10 per cent. Net income for the year just ended totaled $71,803,230, compared to $64,129,918 for the previous 12 months, a gain of $7,673,312.

Shell Union

Shell Union Oil Corp. and subsidiaries report for quarter ended June 30, 1929, profit of $8,051,082 after interest, depreciation, depletion, etc., but before federal taxes comparing with $1,458,577 in preceding quarter and $4,492,069 in June quarter of 1928. Profit for first six months of 1929 totaled $9,509,659 before federal taxes against $6,043,236 in first half of previous year. Stock outstanding amounts to 13,062,336 shares of no-par common stock. Shell Pipe Line Corp., controlled by Shell Union Oil, reports for six months ended June 30, 1929, profit of $6,689,697 after interest, depreciation, etc., but before federal taxes against $1,858,571 in first half of previous year. Profit of Shell Pipe Line Corp. for June quarter was $3,584,069 before providing for federal taxes, against $3,-105,628 in preceding quarter.

Twenty Representative Stocks

The Oil and Gas Journal's weekly average price of 20 representative petroleum stocks listed on the New York Stock Exchange and New York Curb, based on closing quotations for Saturday, was as follows:

March 16	58.63	June 8	58.37
March 23	58.52	June 14	57.76
March 30	58.57	June 21	56.76
April 6	58.26	June 28	56.70
April 13	58.52	July 5	56.52
April 20	58.46	July 12	55.69
April 27	58.34	July 19	56.83
May 4	58.14	July 26	55.62
May 11	59.75	Aug. 3	55.09
May 18	59.30	Aug. 10	54.15
May 25	57.73	Aug. 17	60.32
June 1	56.45	Aug. 24	60.61

Standard of Ohio

Standard Oil Co. of Ohio declared regular quarterly dividend of 62½ cents on common, payable October 1 to stock of record September 6.

American Natural Gas Corp.

Consolidated income account of American National Gas Corp. shows that gross revenues for the six months ended June 30, 1929, amounted to $6,788,224, as compared with $6,162,442 for the corresponding period of 1928. Operating expenses, maintenance and general taxes other than Federal taxes totaled $3,418,611, as against $3,259,950. Net operating income before depreciation and depletion was $3,369,613, which compares with $2,-902,492 for the first half of 1928.

INDEPENDENT OILS ON NEW YORK CURB

Compiled by Francis, Bro. & Co., Kennedy Building, Tulsa, Okla.

1926 High	1926 Low	1927 High	1927 Low	1928 High	1928 Low	1929 High	1929 Low	Par value	Stocks	Week ended August 23 Sales	Open	High	Low	Last	Change
$6.75	.45	2⅛	.55	1½	.53	.72	⅝	$5	Amer. Con. Oilfields	3,500	⅝	⅝	¼	⅜	...
..	..	7½	2¾	9½	3½	8⅝	3½	N.P.	Amer. Maracaibo	5,800	3⅞	4⅝	3¾	4	...
..	..	2¾	1	4½	2¼	5	1⅞	$10	Argo Oil	800	2	2½	2	2½	+ ⅝
85¼	60	40	20½	55	32¾	62	45	N.P.	British American	No sales.					
28⅜	9¼	28¼	15½	4½	3⅞	4⅞	2⅝	25c	Carib. Syndicate (new)	2,700	3¾	3¾	3	3	— ⅜
..	..	58¾	40¼	90⅞	54	47	28½	$20	Cities Service	47,500	50	50¼	49⅞	50¼	+ ¼
..	..	95⅜	87	103½	94½	98¾	93½	100	Cities Service, pfd.	200	94½	94⅞	94½	94⅞	+ ¾
..	..	8⅞	7⅜	9⅝	8⅞	9¼	9	10	Cities Service, pfd. B	200	9	9	9	9	— ⅛
3½	1¾	3⅞	1⅛	3¼	.76	2	⅞	1	Colombia Syndicate	400	..	⅞	¾	¾	...
..	..	9¾	6⅜	8⅞	6¼	11⅛	6⅞	10	Consolidated Royalty	400	5½	5½	5½	5½	— ¾
16	10	14⅞	9½	17½	9½	11¾	7⅞	N.P.	Creole Syndicate	41,100	..	10¼	9	9	— ⅝
..	..	3	.50	3¼	.76	2½	1⅛	N.P.	Crown Central	400	1½	1½	1⅜	1⅜	— ⅝
7⅞	6¾	12	4	33½	3¼	26	14	N.P.	Darby Petroleum	2,900	13⅜	13⅜	12	13¼	+ ¼
..	..	2½	74	2¼	1	11	2	N.P.	Derby Oil & Ref.	3,200	9	9⅛	7⅛	7¼	— ⅛
..	..	16¾	4	21⅛	7½	44	20⅞	N.P.	Derby Oil & Ref., pfd.	200	35	35	35	35	...
..	..	2	.40	.53	.15	..	..	N.P.	Gilliland ctfs.	No sales.					
98	92	118	86¼	165	101⅛	202⅞	142⅛	$25	Gulf Oil Corp.	39,600	206	209	201	204	+ 3
$3.00	.83	2½	.80	3⅜	1	2⅞	1¼	5	Intercontinental Pet.	3,700	1⅛	1⅜	1⅛	1⅛	...
..	..	2¼	1⅛	3	1¼	3⅝	1¾	N.P.	Kirby Petrcleum	500	2¼	2⅜	2¼	2⅜	+ ¼
12¼	5¾	10⅞	5⅛	9⅜	5⅛	6⅛	2⅞	25	Leonard Oil & Dev.	1,600	4⅛	4½	4	4½	+ ½
27	20	27½	20	43⅞	20	38⅞	23⅛	N.P.	Lion Oil & Ref. Co.	1,600	33	35	32⅝	35	+ ½
46	30	59⅜	37	69⅛	48⅛	40	32¼	$25	Lone Star Gas	1,900	..	43⅞	42¼	43¼	+ 1⅛
2⅞	1	2⅞	.80	1⅞	.50	1¼	⅝	1	Magdalena Syndicate	4,700	⅝	¾	⅝	¾	+ ⅜
34	12½	52	12	48½	32	38½	20	N.P.	Margay Oil	No sales.					
8	5½	12⅛	5	8	2¾	6⅜	3⅜	N.P.	Mexico-Ohio Oil	No sales.					
1¾	1⅛	1½	1	1¾	.76	1½	⅞	$1	Mountain & Gulf	400	⅞	1	⅞	⅞	...
26	23	29¼	22¾	28⅞	19½	22⅞	12	10	Mountain Producers	2,900	12½	13	12¼	12¾	+ ¾
6⅝	5	5⅞	4⅝	5⅝	4¼	5	3⅜	5	New Bradford	800	3	3¾	3	3¾	+ ¾
..	..	16	9¼	11⅞	7⅛	9⅜	5½	1	New Mex. & Ariz.	3,200	5⅝	7	5⅝	7	+ 1
..	..	12¾	9½	14¼	8½	11⅞	3¾	N.P.	North Central Texas	1,500	16⅝	16⅝	14⅝	14⅝	— 1⅜
10⅛	5⅞	9⅜	3¼	6	2⅛	3½	1⅜	N.P.	Pandem	4,200	1⅜	1⅜	1	1¼	+ ⅛
12¼	11⅜	12½	7	15⅝	8½	10¼	5⅞	N.P.	Pantepec Oil	2,100	5¾	5⅞	5¼	5⅞	+ ⅝
22¾	12	13½	5⅛	7¾	4⅞	7⅝	4⅜	N.P.	Pennok Oil	No sales.					
17	8½	24⅜	7	18	4⅞	16	11½	25	Red Bank Oil	No sales.					
30¼	12	15½	3½	12⅞	4⅛	8½	4½	N.P.	Reiter-Foster	900	5½	5½	5	5	— ⅜
7	4½	7	4½	12	4⅛	11	6	N.P.	Ryan Consolidated	100	5½	5½	5½	5½	+ ½
10	7⅛	8	5¼	7⅛	5½	5⅞	2⅜	$10	Salt Creek Cons.	400	2⅝	2⅝	2⅝	2⅝	+ ⅜
35	24⅛	35½	27¼	35	23⅛	25⅞	14⅝	10	Salt Creek Prod.	2,000	14⅞	15	14½	14¾	+ ¼
6⅞	1¼	7	1¼	3½	1	2½	1⅛	5	Savoy Oil	No sales.					
92	63½	92	63½	93¼	75	145	82	100	Transcontinental, pfd.	No sales.					
8	4½	7⅜	4¼	9½	4¾	6½	3½	5	Venezuelan Petrol	2,300	3½	3⅞	3¼	3¾	+ ½
8⅛	5½	8	4⅜	8¼	4⅞	9⅛	4⅛	$1	Woodley Petroleum	100	4¼	4¼	4¼	4¼	— ⅛
6½	6	6	1⅝	8⅜	2⅛	..	..	25	Y Oil & Gas (new)	700	1¼	1¼	1⅛	1⅛	...

TRANSACTIONS IN OIL SHARES ON NEW YORK STOCK EXCHANGE

Quotations Compiled by Francis, Bro. & Co., Members of New York Stock Exchange, Kennedy Building, Tulsa, Okla

1926 High	1926 Low	1927 High	1927 Low	1928 High	1928 Low	1929 High	1929 Low		Listed capital	Par value	Div. rate	Last paid	Stocks—	Week ended August 24 Sales	Open	High	Low	Last	Change
32⅞	24¼	37⅝	27⅝	43⅞	27⅛	42⅝	22½	(sh)	922.075	N.P.	50cQ	Oct. 31, 28	Amerada Corp.	7,400	29⅛	30	27⅛	29½	— ¾
74	39⅞	82⅛	35⅛	85	51⅛	64¾	43⅛	(sh)	209.180	N.P.	.....	.....	American Republics Corp.	4.400	42	42⅞	38⅞	41⅞	+ ⅛
60	44¾	50¼	35	53⅜	37½	47¼	40½		$57,260,300	$25	50cQ	Dec. 31, 28	Associated Oil	8.000	44¼	44¼	44	44	— ¼
128⅜	97	131⅜	104	66⅜	50	77⅞	53½		50.000.000	25	25cQ	Dec. 15, 28	Atlantic Refining	110.000	70⅞	71	67⅛	67⅝	— 3¼
33½	23½	35½	20⅜	53	20	49⅛	38⅛		35.194.000	25	50cQ	Feb. 5, 29	Barnsdall Corp.	44.200	41⅜	41⅜	37½	38	— 3¼
94½	50	96⅜	65	94⅞	68	90⅞	61		20.785.400	100	.....	.....	General Asphalt	18.300	93½	93¾	89¾	90½	— 3½
72	50¼	175¾	60⅛	167	79	109	70½		25.000.000	100	.....	.....	Houston Oil	5,900	82½	82½	75	78¼	— 4¼
34	19⅝	32¾	17⅝	38⅜	21¾	39⅜	30	(sh)	959.457	N.P.	50cQ	Jan. 31, 29	Independent Oil & Gas ...	10.500	34⅛	34¼	32⅛	33⅜	+ ⅝
12¾	7½	12⅛	7⅝	39⅝	9	52⅝	29		8.203.080	$10	.....	May 31, 24	Indian Refining	69 600	52	52⅞	47½	48⅛	— 3½
25⅞	16½	37¾	20½	39⅛	27⅜	38⅜	26	(sh)	3,992.122	N.P.	.....	May 1, 27	Lago Oil & Transport ...	5,800	34	34⅝	31¾	32¾	— 1¼
19⅞	12	18⅛	10	19¾	9⅜	18	11¾	(sh)	1,237.078	N.P.	.....	.....	Louisiana Oil Refining ..	16.000	12⅞	13⅛	12¼	12⅞	— ¼
28	16½	22¾	12	25½	12½	18½	12	(sh)	330.000	N.P.	.....	.....	Maracaibo Oil	900	15½	15¾	15	15⅜	— ⅜
63⅜	49¼	58½	31	49¾	33	47⅛	33⅝	(sh)	2,316,692	N.P.	.....	Mar. 31, 27	Marland Oil Co.						
13¾	6	9¼	3	73	4⅝	69⅝	36¼	(sh)	945.939	N.P.	.....	Dec. 15, 20	Mexican Seaboard	41.200	40⅛	40⅜	37¾	38⅛	— 2¾
37	20½	39⅜	25½	44½	25⅛	39⅞	30½	(sh)	1.357.461	N.P.	50cQ	Feb. 15, 29	Mid-Continent Petroleum	41.900	35⅛	35	34½	35¼	— ¾
104½	90	105	97	120½	103¼	121	120¼		$6,718.000	$100	$1.75Q	Sept. 1, 28	Mid-Continent Pet. pfd. ..	No sales.					
2½	½	3¾	1⅝	7⅜	2⅜	5⅛	3½		24.298.850	10	.....	July 1, 23	Middle States	32.500	3	3	2½	2½	— ⅜
76½	56⅛	65⅞	40⅛	54⅞	38¼	63	40¼		48.807.400	$50	.....	Oct. 20, 27	Pan American P. & T. ...	11.400	66	66⅜	63½	64⅝	— 1⅛
78⅜	56⅞	66⅜	40¼	58⅞	37¾	66¾	40½		121,097.900	50	.....	Nov. 15, 24	Pan American P. & T. B.	102.700	66	66¼	64	64⅞	— ¾
46	30	37⅞	16¾	28⅜	15½	17½	13¾	(sh)	400.000	N.P.	.....	Jan. 30, 27	Pan American Western B	7,000	15	15	14½	14½	— ½
32	4½	18⅞	8	21¾	11½	15¼	9	(sh)	198.770	N.P.	.....	.....	Panhandle P. & R.	1.800	10	11	9⅞	9⅞	— ⅛
99⅜	51	83	54	108	70	76	47½		$2.935.200	$100	.....	July 2, 23	Panhandle P. & R. pfd. ..	No sales.					
57⅜	40	60¼	36¼	53⅞	35¼	47	35⅛	(sh)	2.406.796	N.P.	37½cQ	Jan. 2, 29	Phillips Petroleum	18.200	40¼	40½	37⅞	38⅛	— 2⅜
....	....	1⅛	½	5¼	½	3⅜	2		$29,622.925	$25	.....	.....	Pierce Oil Corp.	8.600	2¼	2¼	2	2	— ⅛
7	2¼	5½	2½	7	3½	5⅞	4	(sh)	2.500.000	N.P.	.....	.....	Pierce Petroleum	14.000	5	5⅛	4½	4½	— ⅞
60¼	48	55½	45⅝	68	46	65⅝	53¼		60.000.000	25	.....	Aug. 31, 27	Prairie Oil & Gas	8.700	59⅝	59⅝	57½	58	— 1⅜
137½	122½	190	130¾	280	172	617⅛	53⅝		$101.250.000	$25	75cQ*	Mar. 31, 29	Prairie Pipe	9.000	63	65	62¼	64¾	+ 1⅝
20¾	11	33⅞	16¾	29⅞	16	25⅞	17		$37.450.850	$50	.....	Sept. 15, 23	Producers & Refiners	2.900	16¾	16¾	15	16⅛	— ⅞
41¾	30¾	50	36⅞	49⅝	41	46¾	38¼		2.845.350	50	.....	May 1, 25	Producers & Refiners pfd.	13.000	38	38	37⅝	38	...
31	25¼	33½	25	31⅝	19	30¾	23¼		75.959.350	25	25cQ	Dec. 1, 28	Pure Oil Co.	27.800	27⅞	28¼	26	27	— ⅞
27½	22	28⅝	25⅜	56	23	49⅝	39¾		47.025.000	$25	50cQ*	Nov. 15, 28	Richfield Oil	10.800	43⅞	44⅜	41½	43⅜	— ⅛
57⅜	47⅜	54½	44¼	64	44⅝	55¾	49⅞	(sh)	611,303	13.40	50cQ	Jan. 10, 29	Royal Dutch, N. Y., sh. ..	8.700	53⅛	54⅜	52⅝	53⅛	+ ⅞
48⅝	40½	47⅞	41⅜	57½	40⅝	55¾	43⅞	(sh)	£30,000,000	£1	$1.45	July 23, 28	Shell Transport & T.	1.400	45¼	45½	45¼	45¼	— ½
31	24	31¾	24⅝	39¼	23¼	31¾	25¾	(sh)	20.000.000	N.P.	35cQ	Dec. 31, 28	Shell Union Oil	45 400	28⅞	29½	27⅜	29	...
25⅜	15⅛	26⅜	14¼	27¼	18⅛	39⅜	18⅛		$8.357.000	$10	10cQ	Dec. 15, 28	Simms Petroleum	117.300	39¾	39¾	36¾	38	— 2
24⅞	16¾	22⅜	15	46¾	17⅜	45	35½	(sh)	4,501.915	N.P.	.....	.....	Sinclair Consolidated	285,900	39	38⅜	37⅛	37⅝	— ⅛
99½	90	104½	97	110	102½	111	107		$16,604,600	$100	$2Q	Nov. 15, 28	Sinclair Consolidated pfd.	200	109	109	108¾	108¾	— ¼
37⅛	26⅝	37⅜	24⅛	42⅝	25	46½	32⅞		27.396.590	25	50cQ	Dec. 15, 28	Skelly Oil Co.	20.400	44¾	44¾	41¾	42⅛	— 2⅝
63⅝	51½	60⅜	50⅝	80	53	81⅞	64	(sh)	12.594.098	N.P.	65½cQ	Dec. 15, 28	Standard Oil of Cal.	54 300	78½	79¼	74⅜	77	— ¾
46⅜	37½	41⅜	35½	59⅜	37¾	62⅜	48		$611.120.700	$25	25cQ*	Dec. 15, 28	Standard Oil of N. J. ...	762.300	71⅞	73⅞	68⅛	72⅛	+ 1¼
47¼	30⅜	34⅛	29¾	44¼	28¾	45¾	38		427.973.275	25	40cQ	Dec. 15, 28	Standard Oil of N. Y.	584.100	43	47	40¼	46¼	+ 3⅝
41¾	30⅛	34⅞	30	77	31½	76⅜	57	(sh)	1,206.073	N.P.	25cQ	Dec. 15, 28	Sun Oil	2 300	74⅛	74⅞	74	74	— ⅝
5¼	1	6½	3⅛	14¼	2½	12	7	(sh)	1.267.000	N.P.	.....	Dec. 20, 20	Superior Oil Corp.	16 200	8	8	7	7¼	— ½
58	48	58	45	74⅝	50	68½	57¼		$211.076.650	$25	75cQ	Jan. 1, 29	The Texas Corporation ..	3.700	65½	71¼	63⅞	70⅜	— 5
19½	12	18⅞	12	26⅝	12⅛	23⅞	16		8.380.340	10	.....	Jan. 3, 28	Texas Pacific Coal & Oil .	7.600	19¼	19¼	17½	18½	— 1
39¼	27	29⅛	19	41½	19⅝	40	27⅛	(sh)	2.168.410	N.P.	20cQ	Dec. 15, 28	Tide Water Oil Co.	1.600	36	36⅞	34⅛	35¼	— 1¾
103	87¼	90⅛	85	100⅛	86	97½	90⅛		$20.705.200	$100	65½cQ	Dec. 15, 28	Tide Wat. O. Co. 5% pfd.	400	92	92¼	91¼	91¼	— 1
27	20⅞	19⅛	15¾	25	14¾	23½	17½	(sh)	4.796.158	N.P.	.....	Aug. 1, 27	Tide Water Associated ...	22.500	21¾	21¾	20¾	20⅝	— 1⅜
5½	3	10⅜	3¾	14¾	7¼	14¼	9	(sh)	3,742,029	N.P.	.....	.....	Transcontinental Oil	429 900	13½	14¼	12¼	13¾	+ ½
58⅜	37¼	56½	39⅝	58	42⅜	54½	46		$94.798.100	$25	50cQ	Nov. 10, 28	Union Oil of California ..	39,300	52⅝	53¾	50	53	+ ¾
120⅜	84¼	127½	94	128⅛	110	150¼	121⅞		31,061.200	100	$1.25Q	Dec. 1, 28	Union Tank Car Co.	600	156	156	154	155	— 2
30⅛	23½	34½	24½	44⅞	26	42⅞	28½	(sh)	356.000	N.P.	50cQ	Jan. 2, 29	Warner Quinlan	50,600	34⅞	35	33¾	34	— ½
29¾	25⅛	27½	20	38	20⅛	38	30¼	(sh)	490,000	N.P.	50cQ	Jan. 20, 29	White Eagle Oil & Refg. .	7.500	35⅜	36	34	35	...
....	....	....	....	....	....	29¾	18⅛		.....	....	.....	.....	Wilcox Oil & Gas	1.100	20¼	20¼	19½	20	— ¾

*Also extras. †Ex-dividend.

STANDARD OIL STOCKS ON NEW YORK CURB

21	16	21⅝	17⅞	22⅜	14⅞	18¾	14		£4,126.460	£1	.....	June 6, 28	Anglo-American Oil	800	13⅝	15	13¼	13¼	— 1⅞
....	....	3¾	¾	5	1¼	2½	1⅛	(sh)	500.000	N.P.	.....	.....	Atlantic Lobos	2,000	1½	1⅞	1¼	1¼	— ¼
76	65	69	50	56½	44½	46½	35		1.000.000	25	$1S.A.	Oct. 15, 28	Borne Scrymser	500	26	28	26	28	— 2
59½	42	60	45	76	53	74¼	65¼		10.000.000	50	$1Q	Dec. 15, 28	Buckeye Pipe Line	100	68⅞	68⅞	68⅞	68⅞	...
82½	65	126	76½	161	117	193⅜	140½		3.000.000	25½	$1Q	Dec. 28, 28	Chesebrough Mfg.	800	185	210	185	205¾	+ 9
25⅞	17½	22⅝	16¼	23	16	29	17¼		36,057,840	10	.....	Dec. 15, 27	Continental Oil	3.900	22¼	22⅝	20	20	— 1½
137	102	137	89	114	67	75¾	60		1.500.000	50	$1A	Dec. 15, 28	Cumberland Pipe Line ...	100	65	67	65	67	...
63¾	43	68½	47	88	64⅛	70⅛	59⅛		5,000.000	100	$1Q	Nov. 1, 28	Eureka Pipe Line	50	59	59	59	59	+ 3½
32½	9⅞	13½	3½	13	4¼	6⅝	5⅞		16.000.000	100	.....	June 30, 25	Galena Signal Oil	No sales.					
68½	52	68½	54	114¾	59¼	126⅞	89⅝		73,117.577	25	30cQ*	Jan. 1, 29	Humble Oil & Refining ...	15,200	125½	128	122⅛	125⅝	+ ⅞
144½	125½	182	123¾	290½	176½	340½	290		20.000	100	10%S.A.	Dec. 15, 28	Illinois Pipe Line	150	306	307¾	306	307	+ 1
....	....	64¾	37¾	104	56¾	30⅜	26⅝	(sh)	6.458.267	N.P.	25cQ	Dec. 1, 28	Imperial of Canada	19.400	32⅞	34⅝	32½	33¾	+ 1½
72½	58	94½	61	91⅞	74⅜	28⅜	26¾		$5.000.000	$50	.....	Feb. 15, 29	Indiana Pipe Line (new).	2 300	29¾	30⅞	29¾	30	+ 1¼
35½	28¾	39	28¼	55	35	30⅜	22½	(sh)	7.123.144	N.P.	37½c	Nov. 30, 28	International Pet. (new) .	34,850	28	28½	25¾	26½	— 1⅜
20¾	12½	24	13½	32⅜	19⅜	25⅞	21⅜		$6.363.350	12.50	25c	Dec. 15, 28	National Transit Co.	740	22⅝	22⅞	22	22½	...
51½	27¼	44½	31¼	75	38½	85	70		5,000.000	100	.....	July 15, 26	New York Transit	No sales.					
80½	64	100	70	69	56½	63	52¾		2.000.000	50	$3S.A.	Jan. 2, 29	Northern Pipe Line	150	57¾	57¾	53	53	...
67¾	53¾	67⅞	52	84	58½	75⅝	64⅛		60,000.000	25	50cQ*	Dec. 15, 28	Ohio Oil Co.	11,300	75⅜	76	73	74½	— ¾
24⅜	15	39	12	84	28	44½	23⅛		10.000.000	25	$1.25	Dec. 15, 28	Penn Mex. Fuel	400	33⅞	33⅞	31½	32	— 2
220	84½	201½	175½	220	167	219½	200		4,000,000	100	$5S.A.	Dec. 20, 28	Solar Refining (old)	300	38	39¾	37¾	37¾	— ⅛
....	....	....	....	....	....	50	37¾		.....	....	.....	.....	Solar Refining (new)						
74½	61½	27¼	15½	19	15	22½	13		1,000.000	10	$2	Dec. 1, 27	Southern Pipe Line	100	21	21	21	21	...
50	34½	41½	35	71⅞	36¾	69⅞	62		2,000,000	25	50cQ	Dec. 31, 28	South Penn Oil (old)	1,700	52	53	50	51½	— ⅜
....	....	....	....	....	....	60¼	40⅜		.....	....	.....	.....	South Penn Oil (new) ...						
56	47½	83	55½	102	70	70	62¾		3.500.000	100	$1Q	Oct. 1, 28	Southwest Pa. Pipe Lines.	No sales.					
70½	60½	81½	64⅝	95⅞	70⅞	63	54		228.415.463	25	61½Q	Dec. 15, 28	Standard Oil of Indiana ..	732.100	58	58	50	56	+ 1½
36½	16½	20⅞	14⅝	37¾	15	22½	18		8.000.000	25	.....	June 16, 24	Standard Oil of Kansas ..	1.230	25¾	25⅞	23	23	— 2½
134⅜	108	130	111½	179¾	122¼	45¼	35⅛		17.012.559	10	$1Q	Dec. 31, 28	Standard Oil of Kentucky.	6,200	38	38½	36⅝	37	— 1
51⅛	42	49½	40	54⅞	39⅞	50¼	45½		4.559.850	25	63cQ	Dec. 20, 28	Standard Oil of Nebraska.	400	49⅜	49⅝	48⅞	48⅞	...
372	288	87½	72	134	71	129	110¼		14,000.000	25	62½cQ	Jan. 2, 29	Standard Oil of Ohio	2,810	120	127¾	120	120	+ 2½
21	15	21	14½	23½	16	18	15		861.000	25	.....	Nov . 1, 19	Swan Finch Co.	No sales.					
109⅜	90¼	....	....	111	72	133¾	105½		125,619.000	25	75cQ	Dec. 20, 28	Vacuum Oil Co.	6,800	123½	127½	120	126¾	+ 5¼

*Also extras.

PIPE LINE VETERAN HONORED

OIL CITY, Pa., Aug. 26.—Harry P. Clark, pioneer pipe line worker, employed by various companies in these oil fields for 56 years, was a guest of honor at a picnic of the gaugers of the Clarion district of the National Transit Co. held at Oak Grove. He was presented with a gold watch and his wife with a gold piece, the presentation speech being made by H. H. Shaw, burgess of Knox, who is a Clarion district gauger. The affair was attended by about 200 persons.

BASIS FOR INTERSTATE PACT

The Federal Oil Conservation Board states that if it successfully operates in conserving oil, the new law of California forbidding the waste of natural gas will be taken as the basis for an interstate compact for adoption by oil producing states. The board says that in case American companies in the United States agree to oil conservation programs, there should be some agreement to restrict the exportation of foreign oil to the United States.

TEXAS PANHANDLE

(Continued from Page 68)

Waggoner had an initial production of 72 bbls. at 2,413 feet. Their No. 2 Waggoner had an initial production of 120 bbls. at 2,298-2,330 feet.

PANHANDLE COMPLETIONS
Week Ended August 24

Gray County

Skelly Oil Co.'s No. 1 Jackson, located in Section 62, Block B-2, H.&G.N.R.R. Survey, was drilled to a total depth of 3,129 feet and had an initial production of 615 bbls. at 2,995-3,100 and at 3,097-3,100 feet. Their No. 2 Jackson, located in Section 90, Block B-2, was drilled to a total depth of 3,060 feet, topped the pay at 2,950-58 feet and at 2,997-3,003 feet and had an initial production of 240 bbls. Their No. 2 Jackson (north) had an initial production of 600 bbls. oil and 500,000 feet of gas at 2,934-35 feet and at 3,035-50 feet. Their No. 3 Jackson, located in Section 90, Block B-2, H.& G.N.R.R. Survey, had an initial production of 4,500 bbls. oil and 2,000 000 feet of gas at 2,921-26 and 2,954-68 feet. Their No. 4 Jackson was drilled to a total depth of 3,080 feet, topped the pay at 3.040-55 feet and had an initial production of 1,440 bbls. oil and 12,000,000 feet of gas. The Texas Company's No. 8 Bowers was drilled to a total depth of 3,080 feet, topped the pay at 3,025-35 feet and at 3,065-75 feet and had an initial production of 6,837 bbls. Their No. 13 Bowers had an initial production of 6 837 bbls. at 2,925-35 feet and at 2,993-3 000 feet. Their No. 2 McLarty-Lester-B, located center of J. M. Rose Survey, had an initial production of 234 bbls. at 2,663-75 feet. Their No. 11 Saunders had an initial production of 375 bbls. at 2,710-30 feet. Their No. 3 Patton had an initial production of 350 bbls. at 2 840-50 feet and at 2,917-40 feet. Their No. 4 Patton had an initial production of 50 bbls. at 2,834-40 feet and at 2,970-80 feet. Continental Oil Co.'s No. 5 Finley-Brown topped the pay at 2,890-2,911 feet and was drilled to a total depth of 2,911 feet.

Hartley County

Canadian River Gas Co.'s No. 9 Lee Bivins "A" was drilled to a total depth of 4,145 feet, plugged back to 3 835 feet, shot with 190 quarts from 3.785-3 835 feet, shot again with 80 quarts from 3.770-3 830 feet and with 150 quarts from 3 760-3.830 feet and had an initial production of 10 000,000 feet of gas.

RANGER COMPLETIONS

Brown County

Bowers and Vacuum Oil Co.'s No. 1 Cason was dry and abandoned at 2.082 feet. Estacado Oil Co.'s No. 2 Bull was shot with 10 quarts at 1,428-38 feet and dry and abandoned at 1.147 feet. Green Production Co.'s No. 4 Davis had an initial production of 150 bbls. at 1,308-17½ feet. Humble Oil & Refining Co.'s No. 2-B Hickman had an initial production of 350 bbls. after being shot with 10 quarts at 1.284-94 feet. Mitcham's No. 1 Suttles had an initial production of 3,917,000 feet of gas at 1,620 feet. Owen and others' No. 3 Cannon had an initial production of 8 bbls. after being shot with 5 quarts at 1,142-57 feet.

Callahan County

Beams Drew's No. 5 Jackson-B was dry and abandoned at a total depth of 1,036 feet.

Concho County

Jones-Liner's No. 1 Jones was drilled to a total depth of 2,700 feet, plugged back to 1,975 feet, shot with 80 quarts at 1.975-77 feet and was dry and abandoned.

Coleman County

Broderick & Calvert's No. 2 Weaver was dry and abandoned after having been shot with 30 quarts at 1,847-58 feet. Eastland Oil Co. and others' No. 8-A Morris had an initial production of 31 bbls. at 1,985-87 feet and was drilled to a total depth of 2,015 feet. Their No. 11-A Morris had an initial productioin of 750 bbls. at 1,996-2,019 feet. White Eagle Oil Co.'s No. 5 Morris had an initial production of 615 bbls. at 2,026-37 feet. Brook-Humphrey's No. 1 McAdams was dry and abandoned at 1,018 feet. Their No. 1 Sears was dry and abandoned at 1,025 feet. Their No. 2 Sears was dry and abandoned at 973 feet. Humphrey Brothers' No. 1 Oliver was dry and abandoned at 1,941 feet. S. B. Owens and others' No. 1 Brenke was dry and abandoned at 850 feet. Van Bibber and others' No. 1 Pierce was dry and abandoned at 630 feet.

Erath County

Cranfill & Reynolds and Amerada Petroleum Co.'s No. 1 Gibson had an initial production of 2,282,000 feet of gas after being shot with 40 quarts at 3,292-3,313 feet and drilled to a total depth of 3,400 feet.

Eastland County

Arkansas Fuel Oil Co.'s No. 8 Lyerla was dry and abandoned at 1,442 feet. Garrett & Moore and others' No. 1 Casey had an initial production of 550.000 feet of gas at 3,098-3,190 feet. Mook-Texas' No. 10 Sibley had an initial production of 1,500,000 feet of gas at 2,895-2,905 feet. Arnold's No. 1 MacMullen was dry and abandoned at 3,628 feet. Forster and others' No. 3 Spencer location was abandoned. Whiteside Brothers' No. 1 Murrell had an initial production of 1,-500,000 feet of gas at 1,318-30 feet.

Palo Pinto County

Schnaufer's No. 1 Costello was temporarily abandoned at 350 feet. Texas Pacific Coal & Oil Co.'s No. 159 Stuart had an initial production of 150 bbls. at 1,587-1,603 feet.

Stephens County

Prairie Oil & Gas Co.'s No. 2 Rogers was shot with 100 quarts at 3.263-3,302 feet and with another 100 quarts at 3,-013-52 feet and was dry and abandoned at that depth.

Shackelford County

A. J. Hughes' No. 3 Hill was dry and abandoned at 718 feet. Moutray Oil Co.'s No. 1 Moberly was dry and abandoned at 1,101 feet. Roeser & Pendleton's No. 10-A-88 Cook made 19,000,000 feet of gas and 60 bbls. oil at 1,383-96 feet and at 1,376-98 feet. Their No. 11-A-88 Cook made 11,000,000 feet of gas and 100 bbls. oil at 1,413-22 and 1,422-23 feet. Their No. 13-A-88 Cook made 17,000,000 feet of gas and 150 bbls. oil at 1,410-16 feet and 1,416-18 feet.

Estimated Daily Average Production
Week Ending August 24
North Texas

Panhandle district—	Prod.
Carson County	9,375
Hutchinson County	24,839
Gray County	97,531
Moore County	1,096
Potter County	0
Wheeler Coun.y	723
Total this week	133,624
Total last week	124,768
Increase	8,856
Wichita Falls district—	
Archer County	19,782
Baylor County	76
Clay County	727
Cooke County	11,486
Foard County	260
Jack County	3,610
Haskell County	100
Montague County	6,449
Throckmorton County	686
Wilbarger County	32,742
Young Coun.y	8,248
Wichita County	26,387
Total this week	110,553
Total last week	109,550
Increase	1,003
Ranger district—	
Brown County	8,395
Callahan County	4,125
Coleman County	7,390
Comanche County	1,995
Palo Pinto County	440
Eastland County	6,157
Shackelford County	11,050
Stephens County	6,748
To al this week	46,300
Total last week	43,653
Increase	2,647
Grand total this week	290,477
Grand total last week	279,517
Increase	10,960

WEST TEXAS FIELDS

(Continued from Page 61)

in 20 minutes, gauging one of the best wells in the field.

An interesting test for Gaines County is to be drilled by the Deep Rock Oil Co. on the Ogden ranch in Section 6, Block A-16, Public School Lands. It is to be located about three-quarters of a mile northwest of the company's No. 1 Harris, in the belief that the structure lies to the west of the company's previous test. The Mid-Continent's No. 1 Fisher, recently abandoned at a total depth of 4,476 feet, after showings of oil above, gave geological data to this area, and helped maintain the presumption of a structure to the west of the Deep Rock No. 1 Harris. The Mid-Continent well was located in Section 5, Block A-26.

The Lion Oil & Refining Co.'s No. 1 Coffee, in Section 22, Block 33, T-2-S, T.&P. Survey, Glasscock County, gave all indications of extending the Glasscock-Howard Pool another half mile to the southwest after it had topped the lime at 2,055 feet, the pay at 2,152 feet, and was shut down for storage at 2,182 feet with a hole full of oil. Elevation of this test is 2.607 feet.

The Kirby Petroleum Co.'s No. 1 Phillips, in Section 23, to the east of the Lion well, is still having trouble with the casing which was damanged when the well was shot a few weeks ago, and the 6-inch probably will be swedged in order to allow running of the 5-inch casing. It is also standing with a hole full of oil. It topped the pay at 2,212 feet and was shut down at 2,268 feet and shot with 210 quarts from 2,160-2,200 feet and messed up the pipe, causing a fishing and swedging job. Before the shot it produced 188 bbls. in six hours on the swab.

Contract With Tonkawa

The Tonkawa Refining Co. has recently signed a contract with the Continental Oil Co. for 2,000 bbls. of crude oil daily, for its refinery at Pyote, Tex. This refinery has been running on crude purchased from the Texon Oil & Land Co.'s Winkler County leases, but the contract expired recently and it was necessary to procure another contract. Texon, a subsidiary of the Continental Oil Co., will deliver the crude to the refinery for Continental. It is understood that Tonkawa paid a 10-cent premium above the posted market price for Winkler County crude.

It is also reported that the Pecos Valley Refining Co. and Amarillo Refining Co., both at Pyote, Tex., are shut down for lack of crude oil.

Notice has been sent out by the Texas Railroad Commission, of a hearing to be held in the commission's office at the State Capitol, Austin, Tex., at 10 o'clock September 16, to consider lifting the proration on the 2,500-foot sand in the Roberts area, and also lifting the proration in all producing horizons in the fields in this area. It is generally believed that the proration will be lifted as most of the operators cannot produce more than their present allotment, many of the wells falling short of their allowed amount.

Notices have been mailed pertaining to the Humble Oil & Refining Co.'s computing future crude purchases in West Texas on the basis of 60 degrees Fahrenheit, with temperature corrections in accordance with Rule 9 of Rules and Regulations of the Texas Railroad Commission, Circular 10, which provides for corrections at the rate of 1 per cent for every 25 degrees temperature below or above 60 degrees Fahrenheit. This new ruling is to become effective September 1, of this year.

WEST TEXAS COMPLETIONS
Week ending August 24

Crane County

Humble Oil & Refining Co.'s No. 1-D University, located 2,310 feet from north and 1,650 feet from west of Section 34, Block 30, topped the salt at 1,100 feet, topped the lime at 2,872 feet, topped the pay at 2,970 feet, was drilled to a total depth at 3,020 feet, was shot with 120 quarts at 2,960-3,020 feet and had an initial production of 132 bbls.

Howard County

Fuhrman Oil Co.'s No. 1 Reed, located 2,310 feet from south and 330 feet from west of Section 41, Block 32, T-1-N, topped the salt at 935 feet, topped the lime at 2,745 feet, encountered sulphur water at 3,274 feet and was dry and abandoned. McGinley and others' No. 1 Barnett Hyman, located 330 feet from north and west of Section 92, Block 29, topped the pay at 1,327 feet, was drilled to a total depth of 1,345 feet, was shot with 30 quarts at 1,327-43 feet and had an initial production of 15 bbls. Moody Oil Corp.'s No. 17-B Roberts, located 1,-650 feet from north and 330 feet from west of Section 137, Block 29, topped the pay at 1,316 feet, was drilled to a total depth of 1,410 feet and had an initial production of 50 bbls. Owen & Sloan's No. 13 Roberts, located 1,700 feet from south and 330 feet from east of Section 136, Block 29, topped the pay at 1,293 feet, was drilled to a total depth of 1,374 feet and had an initial production of 75 bbls.

Irion County

Baker & Hodges' No. 1 Tankersley, located 1,320 feet from south and 150 feet from west of Section 23, was dry and abandoned with a hole full of sulphur water at 1,372 feet.

Jones County

Cosden & Herbert's No. 1 Bickley, located Section 50, Block 18, T.P.R.R. Survey, had an initial production of 28 bbls. at 2,491-97 feet. The Texas Company's No. 4 Camp had an initial production of 100 bbls. at 2,480-85 feet.

Mitchell County

California Co.'s No. 7 Foster, located 733 feet from south and 1,580 feet from west of Section 6, Block 29, T-1-S, topped the pay at 2,705 feet, was drilled to a total depth of 2,825 feet and had an initial production of 75 bbls. West Hyde's No. 1 Ellwood, located 1,320 feet from south and west of Section 38, Block 16, was dry and abandoned at 3,216 feet.

Pecos County

Shell Oil Co.'s No. 11-A Smith, located 330 feet from north and 3.060 feet from east of Section 27, Block 194, topped the pay at 1,470 feet, was drilled to a total depth of 1,542 feet and had an initial production of 28 bbls. Taylor-Link Oil Co.'s No. 2 University, located 330 feet from north and 1,046 feet from west of Section 31, Block 16, topped the salt at 850 feet, topped the lime at 1,405 feet, topped the pay at 1,616 feet, was drilled to a total depth of 1,631 feet and had an initial production of 1,500 bbls.

Runnels County

Independent Oil & Gas Co.'s No. 1 Rollwitz, located 2,310 feet from south and 330 feet from east of Section 20, was dry and abandoned at 4,317 feet with a hole full of sulphur water.

Winkler County

Kermit Oil Co.'s No. 1 Carter, located 640 feet south and 2,227 feet west of Section 10, Block B-12, was temporarily abandoned at 400 feet. Magnolia Petroleum Co.'s No. 2 Scarborough, located 1,-620 feet south and 990 feet east of Section 1, Block C-22, P. S. Land, topped the pay at 2,870 feet, had gas show at 2,823 feet, was drilled to a total depth of 3,062 feet and had an initial production of 155 bbls. daily. Skelly Oil Co.'s No. 4 Daugherty, located 2,310 feet south and 1,320 feet west of Section 22, Block 26, topped the lime at 2,476 feet, was drilled to a total depth of 2,935 feet and had an initial production of 130 bbls. daily, 75 per cent water.

PECOS COUNTY
Week ending August 20

Company, lease—	Wells	Prod.
M. H. Black:		
Fee	1	14
California Co.:		
Yates—Lease 1	18	9,510
Smith—Lease 1, Sec. 37	3	510
Smith—Lease 1, Sec. 23	7	1,826
Smith—Lease 1, Sec. 21	3	950
Smith—Lease 2	2	110
Smith—Lease 3	12	2,594
Smith	1	11
Tippett—Lease 1	1	40
Cosby Drilling Co.:		
Smith	1	237
Dorn & McGee:		
Pecos Valley	1	20
Grayburg Oil Co.:		
Pecos River Bed	6	100
Salvage	..	400
Gulf Prod. Co.:		
All leases	37	18,572
Humble Oil & Ref. Co.:		
Smith-A	10	2,156
Smith-B	7	1,102
Kirby Pet. Co.:		
Tippett	2	60
Kirby Pet. and Edson:		
Tippett	1	240
Marland Oil Co.:		
Yates-A	6	725
Yates-A salvage	..	5,737
Mazda & Savoy:		
Smith	3	660
McCarty Oil Co.:		
Gray	1	10
Bennett	1	14
McMan Oil & Gas Co.:		
Smith-A	1	1,541
Smith-B	4	1,537

Company, lease—	Wells	Prod.
Smith-C	7	765
Tippett	2	224
Richardson	1	155
McMan and Marland:		
Yates	16	6,793
Mid-Kansas and Transcon.:		
Yates-A	27	17,493
Yates-B	27	7,588
Yates-C	11	7,680
Yates-D	7	8,833
Yates-E	2	570
Yates-F	4	883
Yates-G	3	1,214
Yates-H	9	5,842
Smith	4	1,961
Smith	18	5,264
J. D. O'Mara:		
Buts	1	40
Pecos Valley Oil Co.:		
Fee, Sec. 22, Blk. 26	2	61
Phillips Pet. Corp.:		
Monroe	1	100
Ramsey	2	622
Smith	2	650
Plymouth Oil Co.:		
Perry	1	30
Red Bank Oil Co.:		
Smith	5	505
Shell Pet. Corp.:		
Tippett	11	3,068
Smith	11	1,641
Smith-B	1	661
Smith-D	4	922
Smith-E	1	19
Simms Oil Co.:		
Smith	7	7,904
Skelly Oil Co.:		
Tippett	1	90
Taylor-Link:		
University	1	84
Total Yates Field	318	130,340

PIPE LINE RUNS
August 8 to August 14
Runs Through Trunk Lines

	Last period
Atlantic P. L. Co., Port Arthur, Tex.	36,500
Gulf P. L., to coast via Ranger, Tex.	46,427
Humble P. L. Co., Comyn, Tex.	49,663
Humble P. L. Co., Ingleside, Tex.	49,576
Illinois P. L. Co., via Del Rio, Tex.	50,000
Magnolia P. L. Co., to DeLeon, Tex.	31,282
Pasotex P. L. Co., El Paso, Tex.	8,258
Shell P. L. Co., Healdton, Okla.	40,531
Shell P. L. Co., Houston, Tex.	7,000
The Texas Co., Houston, Tex.	45,296
Total	364,583

Tank Car Shipments

Reagan County Co., Kemper, Tex.	538
Thomas & Brann, Grant City	100
Orient, McCamey, Tex.	100
The Texas Co., Crossett, Tex.	Off
T. P. C. & O. Co., McCamey, Tex.	Off
American Pet. Co., Pyote, Tex.	4,614
Skelly Oil Co., Pecos, Tex.	Off
S. C. O. P. Co., Wickett, Tex.	13,411
Total	18,753

Runs to West Texas Refineries

Amarillo Prod. Co., Pyote, Tex.	Off
Bluebonnett Ref. Co., Wickett, Tex.	3,923
Burford Ref. Co., Pecos, Tex.	4,675
Col-Tex Ref. Co., Colorado, Tex.	7,009
Cosden Ref. Co., Big Spring, Tex.	7,319
Great West. Ref. Co., Big Spring, Tex.	3,735
Humble O. & R. Co., McCamey, Tex.	11,010
Midland Ref. Co., Midland, Tex.	1,658
Tonkawa Ref. Co., Pyote, Tex.	1,695
Valley Ref. Co., Pyote, Tex.	Off
Big Spring Ref. Co., Big Spring, Tex.	2,317
Richard Ref. Co., Big Spring, Tex.	5,316
Total	48,688

Summary

	Previous week	Last period
Pipe line runs through trunk lines	357,403	364,583
Tank car shipments	20,253	18,763
Runs to West Texas refineries	44,791	48,688
Total daily distribution	422,447	432,034
Total daily production	384,315	370,722
Dail average from storage	38,132	61,312

Estimated Production West Texas
Week Ending August 24

	Wells	Prod.
Crane County	310	37,480
Crockett County	43	1,900
Ector County	3	0
Fisher County	7	1,270
Glasscock and Howard	362	38,455
Jones County	83	3,260
Loving County	13	1,068
Mitchell County	142	2,677
Pecos County	319	130,465
Reagan County	243	17,497
Runnels County	3	20
Scurry County	5	30
Upton County	239	10,220
Ward County	11	1,792
Winkler County	597	131,000
Total this week	2,380	377,154
Total last week	2,387	390,778
Difference	7	13,624

West Texas

Daily Average Pipe Line Runs for July

Company—	Bbls.
American P. L. Co.	5,578
Atlantic P. L. Co.	27,996
Burford P. L. Co.	1,659
Big Spring P. L. Co.	2,379
Cosden & Co.	12,100
Col-Tex Ref. Co.	7,719
Gulf P. L. Co.	35,525
Great Western P. L. Co.	2,936
Humble P. L. Co.	90,349
Illinois P. L. Co.	50,223
Lion Oil & Refining Co.	2,163
Magnolia P. L. Co.	19,463
Paso-Tex P. L. Co.	9,673
Reagan County Purchasing Co.	17,259
Rio Grand Refining Co.	703
Shell P. L. Co.	53,952
Southern Crude P. L. Co.	41,730
Texon P. L. Co.	1,982
Texas P. L. Co.	14,733
Thomas & Brann P. L. Co.	141
Tidal Oil Co. Gathering System	3,172
Wickett Refining Co.	328
Storage	1,671
Total	402,983

KEROSENES, DISTILLATES ADVANCE IN PRICE

(Continued from Page 33)

points. Two major extensions to Chicago and intermediate points are planned. These lines compete directly with fuel oil in commercial accounts and also tend to limit the use of furnace oils in the domestic trade.

Refiners already know the effect of this competition in local trade within the States of Kansas, Oklahoma, Arkansas and Texas. Gas lines now connect to practically all the cities and larger towns within these States. Natural gas at low commercial rates is furnished the public utility plants and manufacturing plants scattered throughout these States. Many of these plants formerly used fuel oil. Outside of the railroads these plants were the most desirable fuel oil buyers. The fuel oil could be delivered with a minimum freight rate and sellers were able to absorb part of this advantage in their f.o.b. quotations.

A large number of refiners at that time had a local outlet for all of their fuel oil output at attractive prices. Many of these refiners located in Kansas, Oklahoma and other points are now compelled to sell a part of their output on the Chicago market which means a low plant price.

The large gas line now being built from Louisiana to St. Louis is indicative of the competitive situation between natural gas and fuel oil. Although this line will not be completed until the latter part of the year, contracts with industrial consumers have already been closed and this has been reflected in the contracts made with refiners for fuel oil. The St. Louis group of refiners are the principal sufferers but the situation there is reflected in other areas.

Gasoline and Naphtha

Sales of the U. S. Motor grade by the larger refiners on Monday and Tuesday were made on a basis of 7¾ cents with one refiner reporting sales at 8 cents. The spot movement was not heavy at these prices. Specification material was freely available from other refiners at 7½ cents with an occasional sale at 7¼ and 7⅜ cents reported.

The movement of high gravities to the domestic trade continued dull. The demand is coming largely from Canadian buyers at prices which are attractive. Sales of 60-62 437 gasoline at U. S. Motor prices were reported. Prices on the better grades of naphtha are steady.

Kerosene and Distillates

The 41-43 water white grade of kerosene in Oklahoma moved up to a low of 5½ cents on Tuesday. The jobber demand is active with a continuance of inter-refinery buying, a development which has greatly aided the market. Most of the larger refiners are quoting 5¾ cents to the trade for the 41-43 grade. The 42-44 water white grade was hard to find the first of the week and the lowest quotation was 6⅛ cents. The price ranged up to 6½ cents.

Distillate prices were also advanced one-eighth cent. The situation in regard to this product has not changed. There are many inquiries in the market and few refiners are willing to sell on the spot market. Several refiners state that they have distillate in storage but their contracts starting next month will absorb their current output and all their storage before the season is over. One large buyer expressed the opinion that distillates would be more freely available later in the fall than they are now.

Although distillate prices are quoted on a gravity basis little attention is paid to gravity in purchases. As has been explained in these columns previously the particular buyer requires a product with a flash around 165 degrees Fahrenheit, straw or prime white color, sweet odor and cold test as near zero as possible. The quantity of distillate meeting these specifications is small.

Fuel Oil and Gas Oil

Buyers of 24-26 gravity fuel oil report quotations as high as 80 cents with a $1 price reported for 28-30. These refiners prefer to use these high gravity fuel oils as charging stock and are not anxious to sell at these prices. There was very little trading over the week in the high gravity grades, sellers being slow in accepting the recent price advances.

The lower gravity fuel oils and gas oils are unchanged in price. The demand for the high gravity grades of gas oil is strong.

Natural Gasoline

A 7-cent price for all grades of natural gasoline is the goal of the Oklahoma and North Texas manufacturers. A few sales of Grades A and AA were made at that figure although other manufacturers were selling as low as 6¾ cents. The remaining grades were bringing a price range of 6⅝ to 6¾ cents.

Buying for Coastal delivery has been steady. The purchases of one company which is a large gasoline manufacturer is said to have totaled around 1,000 cars in August. This company in addition to its own refineries sells to other large Coastal refiners.

The demand from Mid-Continent refiners has also improved indicating that storage of refinery gasoline is being decreased rapidly by a few plants. Manufacturers expect these storage reduction programs to continue over September.

Lubricating Oils and Wax

One of the largest manufacturers of bright stocks has been buying from other Oklahoma manufacturers. This company is a large compounder of motor oils and its own production has not been sufficient to supply an increasing demand. The prevailing market on the 150-160 Grade D color is 36 cents with quotations as high as 38 cents. One refiner is quoting 41 cents for 190-200 grade.

The 150-160, E color is more freely available and the price range on this grade is lower.

Paraffin wax prices are unchanged.

HOOVER'S POSITION ON PUBLIC LANDS

(Continued from Page 37)

and not a state affair. The individual states, at this time, are not financially able, nor are they equipped in even the most meager way, to undertake or carry on this work.

"From both the national and state viewpoint, it would be a disaster to attempt to reverse this procedure.

"In the second place, the individual states would reap no actual benefit by a surrender of this Federal right to the states, as the individual public-land states are now receiving, through the reclamation act, every dollar of revenue that comes from mineral royalties, except a meager 10 per cent of the receipts which the Federal Government retains for its supervisory control and administration of the underground mineral wealth.

"Surely, the states could not hope to carry on this work of exploration and administration so cheaply or with such efficiency.

"All this proposed plan for turning over the public lands and making more flexible the present reclamation act involve favorable congressional action.

"I believe that under the kindly and intelligent leadership of the President, these two things are possible; and that the Congress will follow his leadership in bringing it to a successful conclusion.

"But a proposal to Congress to turn over the coal, oil, potash, phosphates, and metalliferous ores to the several states, with our minimum of representation in the House and Senate, would be hopelessly impossible from its inception.

"All of us present here today will, in the coming years, pay grateful recognition to the act of President Hoover in trying to lessen the present wastefulness in the overproduction of our great natural resource of oil, so that it may be developed in an orderly, economical way.

"From all the royalties paid the Federal Government on oil, coal, and timber sales from public lands, outside the national forests, there is immediately returned to the individual states 37½ per cent for our roads and schools, 10 per cent for administration, the remaining 52½ per cent being paid into the reclamation fund.

"When we talk about taking over the mineral wealth for the public-land states, we automatically close down all further aid for reclamation.

"We can not eat our pie and keep it, too."

FAVORS USE OF SHEET ALUMINUM FOR GASKETS

(Continued from Page 349)

around a flexible metallic gasket. To make such a gasket by hand would cost a great many times the price of the gasket as sold by the manufacturer.

The "armor" is made of thin sheet aluminum which is ideal for the purpose. Aluminum is used for the armor because it is rust resisting, acid resisting, capable of withstanding high temperatures and electrolitically it is neutral. Other metals are objectionable for use as gaskets because of their tendency to cause galvanic current. Aluminum is soft, consequently takes care of rough and uneven surfaces admirably; actual service tests have proven this in innumerable cases.

Another advantage possessed by this factory-made armor-clad gasket is a web which extends out to any width desired depending upon the inside diameter of the bolt circle. For example, if the inside diameter of the bolt circle is 10 inches and the inside diameter of the pipe is 6 inches, the factory product armor-clad gasket is made in such a way that the gasket proper fits almost flush and concentric with the opening of the pipe, being held in place by the web which in turn is supported by the bolts.

SOME PROBLEMS IN DEEP WELL PUMPING

(Continued from Page 37)

the maximum load is higher than that shown by Card No. 2, Figure 1, which was taken at the same well at the same length and frequency of stroke, when it had pumped up and was discharging fluid into the tank. The absence of the retarding effects of the fluid in Card No. 1 caused the rods to fall as fast as the walking beam in the early part of the downstroke and caused the rods to stretch out farther at the bottom of the stroke. A similar condition results from undercounterbalancing which allows high velocities at the bottom of the stroke; overcounterbalancing causes high peak loads near the top of the polished rod stroke due to increased velocities during that portion of the cycle.

Sucker Rods

Field performance seems to uphold the recommendation that sucker rod loads should not exceed 22,000 pounds unit stress which specifically means that seven-eighths-inch rods and three-quarters-inch rods should be subjected to not more than approximately 13,200 pounds and 9,680 pounds load respectively. The maximum operating load at a great many wells is far in excess of these figures, therefore, operators have installed tapered strings of rods in order to more nearly approach the recommended maximum unit stress. It is obvious that the ideal pumping string should be uniformly tapered from top to bottom, thereby securing maximum strength with minimum material (and consequently minimum weight). Since the cost of fabrication of such a string is prohibitive, tapered strings now in use are assembled in sections, the lower sections being of smaller diameter than the sections immediately above it. For convenience in locating the point in rod string where it is permissible to reduce

the size of rods and maintain the same unit stress in the upper portion of each section the following formula has been devised:

suggested. The suggestion is based on a superficial knowledge of metallurgy and may not be economically applicable to this case; but if strengthening by understressing is not dependent upon extremely low loads and if the magnitude of added strength is appreciable, then advantage of this phenomenon may be taken with comparative ease, and will be important to successful operation of the deeper wells.

Formula for Calculating Distribution of Rods in Tapered Strings

$$\frac{C\ (W_1X+W_2\ (D-X)+F)}{A_1} = \frac{C\ (W_2\ (D-X)+F)}{A_2}$$

W_1=Weight per foot of large rods (pounds).
W_2=Weight per foot of small rods (pounds).
D=Depth of well in feet.
F=Calculated weight of fluid (pounds); based on area of plunger times true pumping depth.
A_1=Cross sectional area of large rods (inches).
A_2=Cross sectional area of small rods (inches).
X=Number of feet of large rods.
D–X=Number of feet of small rods.
C=1.2 for polished rod upstroke speeds ranging from 600 to 900 in. per min.
1.3 for polished rod upstroke speeds ranging from 900 to 1,200 in. per min.
1.4 for polished rod upstroke speeds ranging from 1,200 to 1,500 in. per min.
1.5 for polished rod upstroke speeds ranging from 1,500 to 1,800 in. per min.

"C" compensates for the variable inertia loads and for approximate accuracy is dependent on proper counterbalancing.

The pumping string can be designed for only one given maximum load as an increase or decrease in load will result in disproportionate increase or decrease in unit stress in the different sized rods.

In some wells the extreme lower portion of the pumping string is subjected to alternate tension and compression stresses; for this reason, and because of the danger of cork-screwing the lower portion in the event of parted rods, in the upper portion of the string it is advisable that the diameter of the bottom rods in the deep wells be not less than five-eighths inch.

Understressing

The possibility of the practical application to sucker rods of the phenomenon of "strengthening by understressing" is

Hammering Couplings

The failure of threaded rod couplings and pins is resultant in many cases from impact loads due to hammering the joint to loosen it. This practice is analogous to cutting a groove around a bar of metal and striking it a sharp blow to break it at the groove (for the threads are nothing more than grooves). The stresses in box and double-pin rod joints are illustrated in Figure 2, to show that they are operating under severe conditions and should not be subjected to heavy impact loads.

To assure proper "shouldering" of joints under operating loads the initial tension and shear in pins (and corresponding compression and shear in boxes) before application of pumping load should approximate the ultimate load which that portion of the string will carry.

Then under pumping loads the total maximum tension in pins will be approximately twice the load in the rod proper. The threaded portion of the box will be continually in compression and shear whereas the center (the portion not housing the pins) will be in tension of varying magnitude due to varying pumping loads.

Large Working Barrels

A great many deep wells of production ranging from 75 to 150 bbls. daily are being operated with much larger diameter pump barrels than are necessary. By the use of smaller pumps the rod loads at some of these wells may be reduced 15 to 20 per cent without sacrifice of fluid recovery. Pumps of 1½-inch inside diameter will handle most wells of this class, as the increased length of plunger stroke due to reduced pumping load will, with slightly increased speed compensate for the reduction in plunger area. Figure 3 shows a comparison of two pumps at a typical well.

Figure 3—Comparison of results when operating with 2¼" and 1½" inside diameter working barrels at one well.

Size pump	R.P.M.	Length polished rod stroke	Maximum rod load lbs.	Bbls. fluid recovered
2¼"	22	32"	15,800	70
1½"	22	42"	12,200	70

The practice of using cups which are of such diameter as to necessitate their being forcibly inserted in barrel is not only not advantageous but is conducive to their premature depreciation. If such cups are being used and are giving excessive trouble it is suggested that cups be used of such diameter as to fit snugly into the barrel yet move freely.

These suggestions are offered as typical of some of the deep well production problems and careful attention to them and to other details mark the difference between moderate and excessive operating costs in deep well pumping.

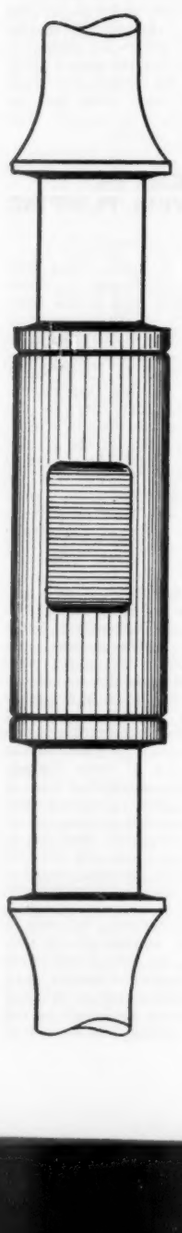


FIG. 2

Showing magnitude and type of loads on Box & double pin couplings under 15,000 lb. rod load. (Cyclic load range - 4000 lbs. to 15000 lbs.)

Tension in pins due to "making up joint" = 15000 lbs; plus operating load = 19000 to 30,000 lbs. tension

Tension in portion of Box not housing pins = 4000 lbs. to 15000 lbs.

Compression in ends of Box due to "making up" joint = 15000 lbs = 15000 lbs negative tension; plus operating load = 11,000 lbs to 0 lbs compression.

SOURCES OF GASOLINE SUPPLY CHANGING

(Continued from Page 38)

sylvania refineries. A low yield of straightrun gasoline is obtained from the West Texas crude oil. The production of cracked gasoline in the Appalachian area increased 22.6 per cent.

Indiana and Illinois

The Indiana-Illinois group of refiners have greatly increased in importance. As a group the first six months of this year they increased their crude runs 13.8 per cent. From this crude oil they were able to increase their output of straightrun gasoline 22.2 per cent with a 27.4 per cent increase in cracked gasoline. Their increase in cracked gasoline exceeds that of any other area.

In Texas, the increase in crude oil runs to stills overshadows in importance the increase in cracked gasoline. The production of cracked gasoline increased 1,509,000 bbls., while the output of straightrun gasoline increased 4,222,000 bbls. The discovery of large crude oil production in West Texas has furnished a crude oil supply to both new and old refiners and there has been an exceptionally large increase in crude oil runs to stills.

The Oklahoma-Kansas group of refiners have had a moderate increase in their crude oil runs to stills and the production of straightrun gasoline and cracked gasoline. The same is true for the Louisiana and Arkansas refiners. However, within this group the Arkansas refiners have greatly increased their crude runs to stills with a similar percentage increase in the production of cracked gasoline.

In regard to the relative production of straightrun gasoline and cracked gasoline it is contended by some that available data do not show the actual increase in the production of the latter. Due to the changes in methods of refinery operation it is difficult to differentiate at several refineries in the production of the two grades of gasoline. Both are now produced in the same continuous operation at some refineries. The operation of reducing stills in which a substantial yield of cracked gasoline is obtained also complicates this situation.

ENGINEERS TO MEET AT GALVESTON NEXT WEEK

(Continued from Page 44)

tice"—District Committees on Production Practice, W. W. Scott, chairman.

3. "Drilling Vertical Holes,"—District Committee on Drilling Practice, Melbert Schwarz, chairman.

The meeting will end with a golf tournament at the Galveston Country Club starting at 1:30 p. m., September 6, and the winners will be awarded suitable prizes. There will be an entrance fee of $2 and those interested in this feature should arrange to register promptly upon reaching the Galvez Hotel.

In the evening of the sixth there will be a banquet at the Galveston Country Club, at which time the prizes won at the golf tournament will be distributed. Registration for this dinner is also required and the charge will be $2 per plate.

Judging by the class of entertainment prepared for the members last year by the Houston Wildcat Committee of the Mid-Continent Oil & Gas Association, headed by W. L. Childs and E. R. Ames.

ARMY AND STATE AGREE AS TO TAX EXEMPTIONS

AUSTIN, Tex., Aug. 24.—Tax-free gasoline for the United States Army will be confined to cars used in an official capacity, according to an agreement which has been entered into by Texas State officials and officers of Eighth Army Corps area. Texas has a 4-cent gasoline tax and there has been considerable friction between the State and army officials regarding the payment of the tax by the latter.

Under an agreement with army officers only cars used in official business may purchase tax-exempt gasoline at post exchanges and commissaries. There is a partial exception on cars owned by officers which are used part of the day on army business and then for private purposes. It is impossible to separate the gasoline so used and the officers will get their fuel tax free. However, a permit is required for each officer entitled to buy tax-free gas. The new orders also prescribe that no gasoline shall be sold in bulk, but only into the tanks of cars which drive up to the exchange filling station.

Private cars used by army people in transporting them to and from their offices or places of work are not entitled to tax-free gasoline.

TABLE 3—CRUDE RUN TO STILLS—FIRST SIX MONTHS 1929

(Data given in barrels)

	1929	Gain over 1928	Pct.
East Coast	84,622,000	1,303,000	1.5
Appalachian	17,102,000	1,341,000	8.5
Indiana-Illinois	52,292,000	6,338,000	13.8
Oklahoma-Kansas	55,984,000	3,405,000	6.5
Texas	103,330,000	15,035,000	17.0
Arkansas-Louisiana	39,004,000	3,741,000	10.6
Rocky Mountains	12,852,000	295,000	2.3
California	115,657,000	14,908,000	14.8
United States	480,843,000	46,366,000	10.7
Gulf Coast	100,756,000	8,283,000	8.9

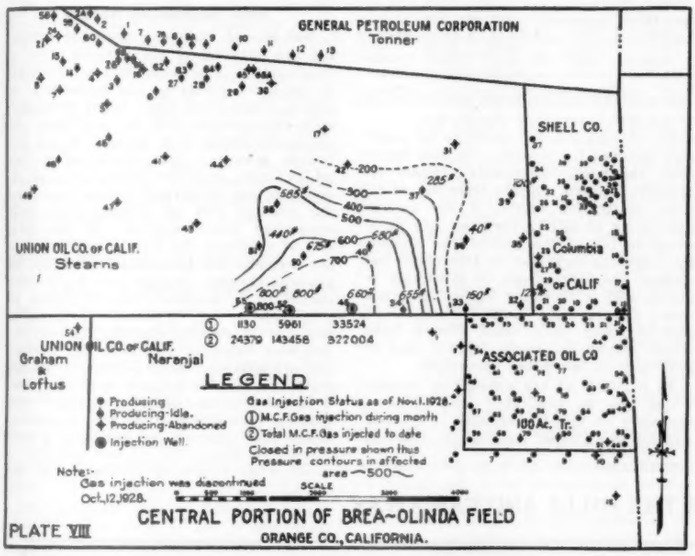
these affairs should be everything that could be desired and it is felt that both events will be largely attended.

The subjects to be discussed at the meeting, together with the other features on the program justify a very full attendance of the members of this and other sections of the Development and Production Engineering Division of the American Petroleum Institute and it is understood that special cars will be run from Tulsa, Shreveport, Dallas, Fort Worth and West Texas, with a great many of the men making the trip by automobile, so it will be well for those who plan to attend the meeting to make early hotel reservations.

UNION STORING OIL IN DEPLETED SANDS

(Continued from Page 36)

restored and an equilibrium established. The gas angle is being taken care of by preliminary repressuring and the introduction of natural gas simultaneous with the injection of oil. This together with a probable lessened surface tension resulting from decreased viscosity due to dilution of the normal Stearns oil with a lighter gravity crude makes the Union's oil and gas injection experiment at Brea Olinda one of special importance.



Repressured First

The Union started repressuring the Stearns lease with surplus natural gas on April 1, 1928, and has injected 489,931,000 feet of gas up to the present time. Gas injection was discontinued on October 12, 1928, at which time 322,004,000 feet had been injected in No. 46 Stearns, 143,458,000 feet in No. 52 Stearns and 24,379,000 feet in No. 55 Stearns. Previous to starting repressuring operations the property had been shut in from June, 1922, to April, 1924, and from May, 1927, up to the present time in the interests of conservation. During these periods no oil or gas was produced although a few wells are producing a small amount at the present time to protect the property from drainage. Approximately 150 acres have been affected by the gas storage and a check indicates that the area involved has produced a total of approximately 5,900,000 bbls. of oil and 4,800,000,000 feet of natural gas. Three wells, Nos. 46, 52 and 55, have been used exclusively for gas injection.

Pressure gauges on surrounding wells on the Stearns lease showed a definite migration northeastward within a short time after gas injection had been started and this trend became more pronounced from time to time. Three months after gas injection was started the migration up the dip had ceased and an easterly migration had set in. Up to this time, July 1, 1928, a total of 145,738,000 feet of natural gas had been stored and in order to minimize further easterly migration and at the same time advance conservation work the Shell Oil Co. closed in their first two lines of offset wells. The injection rate in No. 46 Stearns was simultaneously decreased from approximately 750,000 feet daily to 200,000 feet daily to retard further eastward migration. On August 1, 1928, a total of 209,679,000 feet of gas had been injected in the three injection wells and both northerly and easterly migration had ceased. On September 1, 1928, gas injection in No. 55 Stearns was reduced because of limited compressor capacity but No. 46 was stepped up to 2,000,000 feet daily with a corresponding increase in the injection pressure. On October 1, 1928, six months after the repressuring and gas storage program was started on the Stearns lease, 449,226,000 feet of natural gas had been injected in the three wells. Increased compressor capacity permitted a resumption of injection in No. 55 Stearns and the injection rate in No. 46 was increased to 3,500,000 feet daily. Easterly and northeasterly migration had practically ceased some time ago and migration has begun in a northwesterly direction toward the center of the Union's Stearns property. On October 12, 1928, when gas injection was reduced a very definite northwesterly migration was in evidence.

Throughout the entire period of gas storage there has been no evidence of any of the injected gas leaving the property or the immediate area enclosed in the pressure contours nor has there been any increase in either the oil or gas production from producing wells on adjoining leases to the east. The conservation of approximately 500,000,000 feet of natural gas, which would otherwise have been blown into the air, will more than offset the cost of the program by greatly increasing future oil recovery. This is in addition to probable increased production of normal crude oil from the Stearns lease and the ultimate recovery effected of Santa Fe Springs crude injected for storage purposes. The accompanying graphic charts show the results of the Union gas storage and repressuring operations on the Stearns lease, where oil injection has just been started. The Union's commendable conservation work at Brea Olinda has been conducted under the personal supervision of A. C. Rubel, chief petroleum engineer, who has just been appointed assistant manager of production, and F. W. Lake, superintendent of production, Orange division.

TURNER VALLEY MERGER

CHATHAM, Ontario, Aug. 26.—A merger in the Turner Valley fields has resulted in consolidation of Spa Oils, Aladdin Oils, the Bell Syndicate and an Edmonton syndicate into Alberta Superior Oils, Ltd.

126 QUARTER SECTIONS WILL BE OFFERED AT NEXT OSAGE SALE

The next sale of Osage, Oklahoma, oil leases will be held in Pawhuska, Okla., on Friday, September 20. The sale, as usual, will be at public auction.

Oil leases will be made for a period of five years and as long thereafter as oil is found in paying quantities. This suspends the provisions of the ordinary regulations in the Osage Nation which require the drilling of a well within one year. In the interests of conservation the Government changed the regulation at recent auction sales, and it had the effect of increasing interest in the sales.

Following are the tracts to be offered:

Tract	Description	Acreage
1	NE 33-22-12	160
2	NW 33-22-12	160
3 Fr.	SW 27-28-12	132.20
4 Fr.	NW 34-28-12	131.36
5	NE 22-22-11	160
6	NW 23-22-11	160
7	NW 26-24-11	160
8	NE 28-24-11	160
9	NW 27-27-11	160
10	NE 14-23-10	160
11	NW 14-23-10	160
12	NE 5-27-10	160
13	NE 16-27-10	160
14	SE 18-21- 9	160
15 Fr.	SE 30-21- 9	77.25
16	NE 36-21- 9	160
17	NW 36-21- 9	160
18	NW 4-22- 9	160
19	SW 4-22- 9	160
20	NW 30-22- 9	160
21	SW 30-22- 9	160
22	NE 32-22- 9	160
23	SW 33-22- 9	160
24	SW 16-23- 9	160
25	SE 17-23- 9	160
26	NE 20-23- 9	160
27	NW 21-23- 9	160
28	NE 23-23- 9	160
29	SE 23-23- 9	160
30	SW 23-23- 9	160
31	NW 25-23- 9	160
32	NE 26-23- 9	160
33	SE 21-24- 9	160
34	NE 15-25- 9	160
35	SE 15-25- 9	160
36	SW 15-25- 9	160
37	SE 22-25- 9	160
38	SW 22-25- 9	160
39	NW 27-25- 9	160
40	NE 23-26- 9	160
41	SE 23-26- 9	160
42	SE 33-26- 9	160
43	NW 27-28- 9	160
44	SE 11-21- 8	160
45	NW 4-22- 8	160
46	SW 4-22- 8	160
47	NW 5-22- 8	160
48	NW 7-22- 8	160
49	SW 7-22- 8	160
50	NE 14-23- 8	160
51	SE 10-24- 8	160
52	NW 14-24- 8	160
53	SW 14-24- 8	160
54	NW 17-24- 8	160
55	NW 23-24- 8	160
56	SE 27-24- 8	160
57	SE 30-24- 8	160
58	SW 34-24- 8	160
59	SW 35-24- 8	160
60	SW 15-25- 8	160
61	SW 1-26- 8	160
62	NW 8-26- 8	160
63	SW 8-26- 8	160
64	SW 18-26- 8	160
65	NE 21-27- 8	160
66	SE 21-27- 8	160
67	SE 22-27- 8	160
	West Side	
68	NW 2-23- 7	160
69	NE 3-23- 7	160
70	NW 9-23- 7	160
71	SW 10-23- 7	160
72	NE 11-23- 7	160
73	SE 11-23- 7	160
74	NE 6-24- 7	160
75	NW 15-24- 7	160
76	SE 16-24- 7	160
77	SE 18-24- 7	160
78	SW 18-24- 7	160
79	NE 19-24- 7	160
80	NW 19-24- 7	160
81	SE 21-24- 7	160
82	NE 24-24- 7	160
83	SE 24-24- 7	160
84	SW 13-25- 7	160
85	NW 20-26- 7	160
86	NW 24-26- 7	160
87	SW 24-26- 7	160
88	NE 33-26- 7	160
89	SW 35-26- 7	160
90	NE 15-27- 7	160
91	NW 9-24- 6	160
92	NE 10-24- 6	160
93	SE 10-24- 6	160
94	NE 14-24- 6	160
95	NW 14-24- 6	160
96	SW 17-24- 6	160
97	NE 21-24- 6	160
98	NE 3-25- 6	160
99	SW 5-25- 6	160
100	NE 7-25- 6	160
101	NE 2-26- 6	160
102	SE 2-26- 6	160
103	NW 27-26- 6	160
104	NW 29-26- 6	160
105	SW 29-26- 6	160
106	NE 32-26- 6	160
107	SE 32-26- 6	160
108	NW 33-26- 6	160
109	SW 33-26- 6	160
110	SE 8-27- 6	160
111	NE 1-28- 6	160
112	NE 5-28- 6	160
113	SW 32-29- 6	160
114	SW 33-29- 6	160
115	SE 36-29- 6	160
116	SW 36-29- 6	160
117	SE 14-24- 5	160
118	NW 13-25- 5	160
119	SW 13-25- 5	160
120	SW 15-25- 5	160
121	SE 16-25- 5	160
122	SW 3-26- 5	160
123	NE 10-26- 5	160
124	NW 10-26- 5	160
125	NE 14-26- 4	160
126	SE 14-26- 4	160
Total acreage		20,020.81
East side		10,580.81
West side		9,440.00

OVERPRODUCTION AND GREATER CONSUMPTION

(Continued from Page 36)

product have mounted. Over the corresponding period of 1928 the demand for gasoline in the first six months of this year including exports showed an increase of 15.38 per cent but in the same time refinery runs increased 11.28 per cent, resulting in an increase in the total gasoline supply of 19.03 per cent. There was total consumption including exports increased by 26,000,000 bbls. in the first half of the year. The total supply including imports increased 33,000,000 bbls. It is apparent that refiners anticipating the gain in consumption increased their refiners runs to a greater extent than was needed to meet requirements.

California Situation

"An outstanding example of this is California which increased its gasoline production 38 per cent against a gain in the consumption in the Pacific Coast states of 12 per cent. This situation emphasizes once again the fact that the only definite and fixed factor the petroleum industry has to deal with is market demand and that the overproduction of either crude or finished products cannot be forced into an increased consumption regardless of prices."

CANADIAN COMPANIES FORMED

CHATHAM, Ontario, Aug. 24.—The Olds Dome Oil Co. has been formed by residents of Didsbury, Alberta, to drill a test on an 80-acre lease a mile south of Olds. The company is incorporated under Dominion charter with 200,000 no par shares. The officers are: President, W. R. Coates; directors, P. H. McCann and William McColl; secretary, C. Reiber. No. 1 test will be drilled close to the old Coates syndicate test drilled several years ago but abandoned at comparatively shallow depth. Cable tools will be used, the new test to spud in this fall. The Albion Oil Co. has been organized by Winnipeg and Lethbridge interests to develop an unnamed structure in southern Alberta near Lethbridge. Dr. T. B. Williams is geologizing the structure which will be core-drilled preparatory to putting down a commercial test.

STANDARD APPROVES GAS LAW

The Standard Oil Co. of California in a statement goes on record as strongly approving the new California law to prevent waste of natural gas. The company appealed to the oil industry in general to co-operate in support of the law. The functioning of this act is regarded as having much significance to the oil industry, since the saving of gas which it requires is expected to involve a large reduction in the current volume of California oil production, now much in excess of requirements.

TO EUROPE FOR DEMONSTRATION

J. F. Lincoln, president of the Lincoln Electric Co., recently sailed for London, England, where he will take charge of a demonstration for European engineers of the Electronic Tornado process of carbon arc welding. The demonstration will take place at the Allen Liversidge plant.

What Is Allowable Gas Line Leakage?

Valuable Information Being Accumulated by Which This Question May Be Answered Definitely and Correctly

By Charles E. Williams
United Natural Gas Co., Oil City, Pa.

When leakage is discussed at meetings of natural gas men the question invariably arises, "What is a 'reasonable' or 'allowable' leakage from a pipe line of given size, length and type?" There is little reason to wonder why this question arises so frequently, when it is considered that each line has, or should have, a distinct "allowable" leakage figure strictly its own. The number of conditions which have a bearing on leakage are so numerous that it is difficult to standardize upon a reasonable leakage per unit of length, size and pressure.

Leakage, for comparative purposes, is generally computed in thousands of cubic feet per year per mile of equivalent 3-inch pipe at 100 pounds pressure. On this comparable basis, it has been suggested that volumes of 300, 200 and 100 M.C.F. per year are allowable leakage from screw, rubber-coupled and welded lines, respectively. These figures are based on the results of a large number of tests and are of value in determining actual line conditions, but do not indicate the amount of money that can be profitably spent in reducing leakage. The following actual results of leakage tests will illustrate the difficulty of establishing a definite figure for allowable leakage: a line composed of 1.94 miles of 2-inch, 4-inch and 5⅝-inch screw pipe, one-half buried, gave a leakage of 2,130.7 M.C.F. per year on the comparable basis (3-inch at 100 pounds) but an actual loss in money of only $31.12. The small actual loss is due to the fact that the mean diameter of the line is 2.15 inches and that the average operating pressure is only 3 pounds. Obviously, the "allowable" leakage for this line should be considerably higher than 300 M.C.F. per year on the comparable basis. To locate and repair the source of this leakage would probably cost many times the yearly value of the gas lost and, therefore, extensive repairs on this line could not be considered.

Another screw line leaked 253.2 M.C.F. per year on the comparable basis but, owing to larger line and higher pressure, the actual loss amounted to $1,580 per year. On this line, considerable money could be profitably spent in eliminating the leakage even though it is below the "allowable."

Definition of "Allowable"

"Allowable" leakage in the opinion of the writer is that volume of gas, the value of which is too small to be profitably reduced by repairs. In this definition, the word "profitably" causes the greatest concern. Again referring to the first illustration above, if the leakage amounting to $31.12 per year can be located on top of the ground and repaired by installing say one or two collar-leak clamps, the leakage can be profitably reduced, and is therefore above the allowable. On the other hand, if it is the result of many very small buried leaks, which cannot be easily located and repaired, it is below the allowable.

In arriving at the amount of leakage, which can be profitably reduced, it is necessary to know something of the cost and life of different methods of repairing.

TABLE 1

	Mean Diam. (Inches)	Length (Miles Equiv. 3")	Cost of Repairs 16 Welded	9 Clamped	1 "Tightened"	Cost per Mi. Equiv. 3"	% Decrease in Leakage
Total (26 Lines)		59.05	$10,714.99	$2,615.20	$12.32	$9,229.52	
Average per line	2.93	2.27	.....	.....	.....	354.98	82.75
Average (16 Welded lines)	2.66	1.13	669.69	.....	.....	530.60	85.66
Average (9 Clamped lines)	3.99	4.36	.....	290.58	.....	81.38	76.67
Average (1 "Tightened" line)	3.55	1.67	.....	.....	12.32	7.38	60.80

TABLE 2—COST OF WELDING INSTALLED LINES
Cost of Welding Installed Lines

	Line No. 1	Line No. 2	Line No. 3	Line No. 4	Line No. 5	Total	Cost Per Weld
Length, miles	0.18	0.45	0.68	0.63	0.82	2.76	.....
Number of Welds { 2"	52	57	91	165	231	596	.....
Number of Welds { 3"	..	..	..	...	3	3	.....
Number of Welds { 6"	2	4	2	...	2	10	.....
Total	54	61	93	165	236	609	.....
Carbide	$ 4.90	$ 4.90	$ 5.88	$ 7.30	$ 10.78	$ 33.76	$0.0554
Oxygen	3.00	5.00	8.13	8.38	14.88	39.39	0.0647
Welding Iron	0.90	1.65	3.00	3.00	3.60	12.15	0.0200
Labor & Truck	57.18	73.16	92.95	117.18	196.76	537.23	0.8822
Total	$65.98	$84.71	$109.96	$135.86	$226.02	$622.52	$1.0223

The data in Table 1 have been compiled from several field lines of the United Natural Gas Co. which have been repaired:

In this tabulation, the 16 welded lines were originally composed of screw pipe, but welded to eliminate excessive leakage. For many of these lines the cost of repairs was more than paid for by the saving in leakage during the first year after repairs were completed.

"Clamped" lines are those which were repaired mostly by installing collar-leak clamps and the "tightened" line was repaired by minor operations such as tightening gate stems, repairing punch holes, etc.

More Information Needed

Not enough data are available regarding the duration of the various types of repairing to determine which procedure is the most profitable and economical to follow. Until such time, when more specific information will be available, the above tabulation will be used in the following manner: the length of a line which shows excessive leakage will be reduced to the equivalent 3-inch basis and the average cost of welding each mile equivalent 3-inch applied. If the total cost of repairing the line by welding does not exceed the accumulative values of gas lost through leakage over a five-year period, it is assumed that it would be profitable to weld the line. If, however, the cost of welding the line exceeds the five-year value of gas lost, the average cost per mile equivalent 3-inch for "clamping" the line is applied and compared with the five-year value of leakage. The cost for clamping the line will usually be below the value of gas lost over a five-

CARRYING NATURAL GAS OVER THE HILLS AND FAR AWAY

year period and thus indicate that this type of repairing will be profitable.

It has always been considered profitable to "tighten" any connections which are known to leak, but since the two preceding methods of repairing are believed to be more permanent, they are given preference in order to determine whether or not extensive repairs should be considered. The five-year value of gas lost through leakage is a tentative figure in the comparisons and may be changed in case future results so warrant.

More specific information regarding the cost of welding short sections of old lines for the purpose of reducing leakage is given in Table 2.

It is noticed that the largest item for repairing each line is "labor and truck." This cost is much higher than would be expected in ordinary welded installations because of the amount of time spent in stripping the line and removing the collars and threads preparatory to welding.

These data are even more valuable than that given in the preceding tabulation for specific information on the cost of welding short sections of lines of small diameter.

Results of almost 400 leakage tests by the pressure-drop method, covering a period of four years, have not only furnished valuable information regarding actual line conditions and value of gas lost but have also helped in other problems dealing with efficient pipe line construction and operation. It is readily seen that these valuable data will accumulate as the work progresses, so that such questions as "What is 'Allowable' Leakage?" may eventually be answered more definitely and correctly.

PEOPLES GAS COMPANY TAKES OVER REFINERY

CHICAGO, Aug. 23.—The Peoples Gas By-Products Co. has taken title to the site and refinery of the Interocean Refining Co. at McCook, near this city. The sale of the property was announced early in June of this year, the purchaser being Homer D. Dines, an attorney who stated at the time that he had bought the property but expected to sell it in a short time.

The refinery was a 5,000-bbl. plant erected at the close of the World War. It has not been operated for several years. The sale was made by Bryan Reid, president of the Interocean Sales Co., who has used the tanks for the storage of Petroleum products for six or seven years.

It is stated by the new owners that the tract which is slightly over 100 acres in size will be used for storage and the report is also current that it will be the receiving plant for the new natural gas pipe line which is being built to this city. The Peoples Gas By-Products Co. is a subsidiary of the Peoples Gas Co., dealing chiefly in benzol and other by-products of the gas manufacturing plant. It also owns a small refinery at Cicero, a part of the city, with a capacity of 2,500 bbls. The plant has been idle for several years. It was originally equipped with a cracking process but has since been so changed that it can be operated as a skimming plant.

PURE OIL CO. BUILDING TANK

HOUSTON, Tex., Aug. 26.—The Pure Oil Co. has started construction of a 55,000-bbl. storage tank at its Sweet Lake Field in Cameron Parish, Louisiana. Although the company has had some production there since October, 1926, storage facilities have been limited to a few small tanks and the oil has been moved by barge to the company's refinery at Smith's Bluff, Tex.

KIRK MADE GENERAL MANAGER

HOUSTON, Tex., Aug. 26.—Frank W. Kirk, general superintendent of pipe line for the Houston Pipe Line Co., has been made general manager of the company to succeed C. B. McKinney, who died July 16. Mr. Kirk has been acting general manager since Mr. McKinney's death.

Rumor of Prairie Sinclair Merger Is Given Credence

Rumors which have been in circulation for nearly a year to the effect the Prairie Oil & Gas Co. and Sinclair Consolidated Oil Co. would merge were given renewed impetus during the past week, with officials of both organizations somewhat reticent about making statements. The belief prevails among many operators in close touch with the general situation negotiations looking towards a merger are progressing satisfactorily and will eventually succeed.

Refining facilities of the Prairie Oil & Gas Co. are quite limited and it is felt the consolidation contemplated will provide the Prairie with refining and marketing outlets for its vast crude production and supply. This company has in storage about 54,000,000 bbls. of crude oil, while its production has been averaging a little over 100,000 bbls. daily. Production of the Prairie and Sinclair interests is estimated at approximately 160,000 bbls. daily at this time, which would give the new company resulting from a merger one of the largest productions of crude oil in the world.

BUFFALO MAN OBTAINS OPTION ON OIL TRACT

OIL CITY, Pa., Aug. 26.—A 40-day option has been given on what is believed to be the largest tract of undeveloped oil territory in this district. Charles Kay and W. P. Nutting of Youngsville have given the option on their Plumer property to Thomas Clark, former oil operator of Bradford, who is now located in Buffalo, N. Y.

The Plumer property consists of 1,226 acres in fee and on it are 58 producing wells. Kay & Nutting, who have been in the oil business for 25 years and own other property in this section, have had the Plumer acreage for about 15 years. Until this year the wells were producing from the Red Valley sand at 750 feet but recently some of them have been drilled 50 feet deeper to the second sand, resulting in good wells.

Mr. Clark is said to be considering an extensive development on this tract if the deal is consummated.

PROSPECTIVE PURCHASER PLANS BIG DEVELOPMENT

BRADFORD, Pa., Aug. 26.—Negotiations for the acquisition of 1,226 acres of oil property in Venango County from Charles Kay and W. P. Nutting by Thomas Clark, Buffalo oil operator, and former resident of this city, will soon be completed. Mr. Clark has an option on the property located in lower Cornplanter Township and said to be the largest undeveloped individual oil lease in Venango County. The entire property consists of 1,226 acres in fee, 58 wells drilled to a depth of approximately 750 feet to the first sand, and a number of rigs under construction.

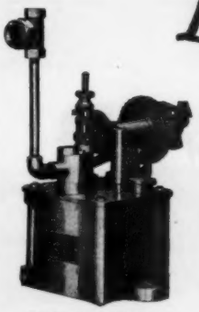
It is understood that as soon as the deal has been completed, Clark will start extensive development.

SUPERIOR OIL CORP.

The Superior Oil Corp. reports a production during the first six months of this year of 1,987,560 bbls., or a daily average of 10,981 bbls., compared with a gross production of 498,414 bbls., or 2,753 bbls. daily, during the corresponding period last year, an increase this year of more than 300 per cent.

GEOLOGISTS ENTERTAINED

MIDLAND, Tex., Aug. 26.—Geological students from Virginia Military Institute who made a field trip through the western part of the United States to study oil geology, were guests of C. A. McClintic, at a barbecue when they visited Midland.



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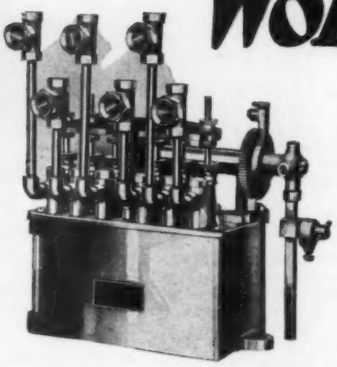
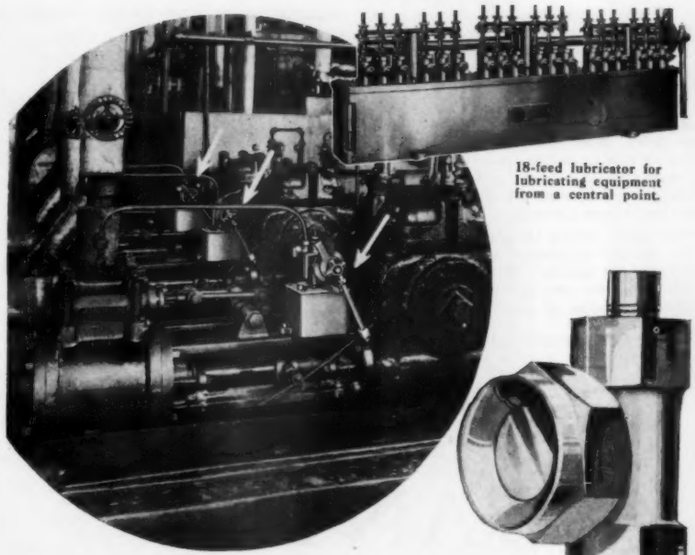
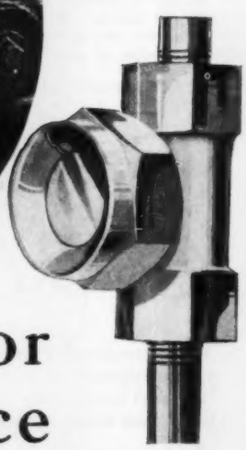


6-feed lubricator, available in ratchet motor — belt and direct reciprocating drives.



18-feed lubricator for lubricating equipment from a central point.



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WORKED ON DRAKE WELL AND REMEMBERS IT ALL

TITUSVILLE, Pa., Aug. 27.—Seventy-two years ago today Samuel B. Smith, who celebrated his eighty-sixth birthday three weeks ago, changed, by a chance drilling experiment, what was known as "Drake's folly" to the opening of the field producing the finest natural oil in the world. Discovery of oil in this town was the first in the world. It was then and is still known as Pennsylvania grade crude oil. The discoverer lives only 2 miles away from the scene of his epochal achievement.

Mr. Smith recalled vividly the details of the event. "Col. Edwin Drake, who promoted the drilling of the first oil well, engaged my father and me to do the drilling," he said. "We were blacksmiths, but had occasionally drilled artesian wells for salt water.

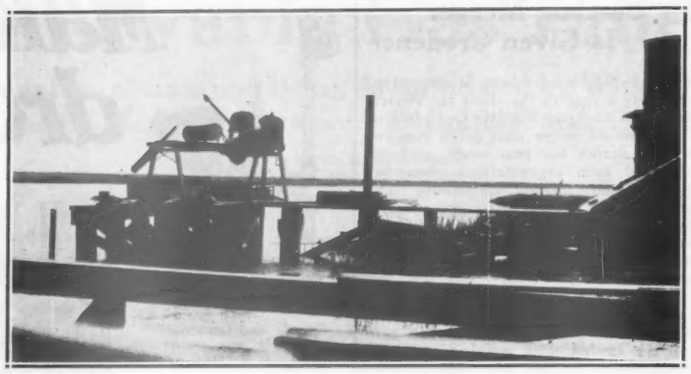
"We spent several months trying to find a way to get down to the rock. Finally at my father's request Colonel Drake went to Erie—it was a long trip in those days—to get five lengths of 6-inch iron pipe, each section 10 feet long. While he was gone, we built a blacksmith's shop alongside the well, and we made the rigging and tools for the drilling.

"We sank four lengths of the new pipe, put a wooden conductor on top of the last length and at a 45-foot depth we struck rock. We cleaned this out and began drilling.

"On the sixth day, when we had gone down 69 feet, I happened to look down the hole. You can imagine my thrill when I saw a yellow foam bubbling up. It was oil. In another few days we had pumps working and the first oil well in the world was producing."

Mr. Smith works 10 hours a day on the acre garden adjoining his home. His hobby is his health. He eats only vegetables from his own garden, does not eat desserts, candies or sweets of any kind, and never used tea, coffee or other stimulants except for a short time when he was in the army during the Civil War.

SHOOS THE MOSQUITOS AWAY



Ford engine does valiant service.

HOUSTON, Tex., Aug. 26.—Making night drilling safe for crews on rigs in the swamps and marshes of coastal Louisiana is what the machine in the accompanying picture does. It is called a mosquito chaser but is nothing more than just an old Ford engine rigged up with a propeller at the rear of the chasis.

One of these machines is installed at each of the rigs of The Texas Company in the southern part of Terrebonne Parish, Louisiana, and each evening as the sun goes down and the swarms of animal size, salt water mosquitos come up to prey on the unfortunate drillers the motor is started up and all night long it does its duty of blowing the mosquitos away.

WEST TEXAS GEOLOGICAL MEET

MIDLAND, Tex., Aug. 26.—Members of the West Texas Geological Society in called session here the night of August 31 will hear Dr. W. V. Howard of the University of Illinois speak on "The Development of Porosity and the Accumulation of Oil in Limestone." The meeting was called by Guy E. Green of the Vacuum Oil Co. at Midland, secretary of the West Texas Geological Society.

Gasoline Agency
WANTED

The Petroleum Products Storage Company, Memphis, Tenn., wishes agency on a commission basis for distribution of gasoline and lubricating oil of some large, nationally known company, not now represented in Memphis.

We are a well established, solid concern, doing a large furnace oil tank wagon business, but only 800,000 gallons gasoline yearly. We have found it impossible to get and hold a large gasoline business under our local brand. But we believe a nationally known concern with a good brand and a good product can be getting 300,000 gallons a month within two years time, using our distributing facilities and established position in Memphis.

Memphis tank wagon market is free of price cutting. Net tank wagon, 12.6c. Freight rate from Group 3, 1.88c per gallon. North Texas, 1.98c.

We are perfectly willing to accept a much smaller commission than we now get as a profit in the belief that increased volume that should come from such a hook-up as we wish, would more than offset our temporary loss.

Petroleum Products Storage Company

W. H. McKinnon, President

MEMPHIS, TENN.

Late Fields

GULF COAST

HOUSTON, Tex., Aug. 27.—Gulf Production Co.'s No. 2 Boyd, a wildcat on the Hankamer prospect in southern Liberty County, blew in this morning making an estimated 30,000,000 feet of gas and flowing 15,000 bbls. of salt water from sand at 3,692 feet. Humble Oil & Refining Co.'s No. 5 Camp at DeWalt also was completed today flowing 400 bbls. daily at 3,590 feet, and the same company's joint test with Valley Oil Corp.'s No. 2 Woodley, at Raccoon Bend, was bailed in for 400 bbls. at 3,448 feet. Gulf Production Co.'s No. 29 Taylor on the southwest side of Pierce Junction was completed today flowing an estimated 2,000 bbls. daily from sand at 4,749 feet.

OKLAHOMA

A deeper producing pay was found in the Oklahoma City Pool this week. The Sinclair Oil & Gas Co.'s No. 1 Stamper, which had drilled into water at 6,639 feet after penetrating a rich oil pay, drilled the well through the water stratum and hit another pay at 6,646 feet and the well on Wednesday morning was flowing 500 bbls. an hour. It had been making 3 400 bbls. of oil per day and the production from the deeper pay increased the well's output to around 9,600 bbls. per day. The discovery well in the field was being deepened Tuesday and other wells in the field will be sent through the water stratum to test for the lower pay.

The Shell Petroleum Corp.'s No. 1 in the C NW NW NE Section 30-11-2w, a south offset to the Prairie Oil & Gas Co.'s No. 1 Hiddleston, blew in unexpectedly Monday afternoon. It found the top of the lime at 6,084 feet and at 6,500 feet began flowing at the rate of 300 bbls. an hour with an accompaniment of between 30,000,000 and 50,000,000 feet of gas. The oil was directed into the slush pit and in 13 hours a part of it, or 2,678 bbls., was recovered.

The production of these two wells increased the output of the field for the 24 hours ending Tuesday morning at 7 o'clock to over 45,183 bbls., but on Wednesday morning the field was producing at the rate of about 52,000 bbls. a day from 13 wells, an average of about 4,046 bbls. per day per well.

Three new wells are expected in shortly, and may be completed within the next week. Two of them, if successful operations, will extend the field a mile or so northerly. The latter two are the Indian Territory Illuminating Oil Co.'s No. 1 Community, C NE SW Section 13-11-2w, and Cromwell, Wirt Franklin and others' No. 2 Trosper Park, C E half W half NW Section 12-11-2w. The latter company's No. 2 Button in Section 19 is the third of the nearly due wells, and may be regarded as an inside well.

CONTESTS ARRANGED FOR PETROLEUM SHOW

(Continued from Page 44)

3. The team members will inspect the complete equipment required in well pulling and report on a form provided every unsafe condition of tools or equipment.

4. Each team will be judged by three competent judges who will inspect the rig before the contest and note all unsafe conditions.

5. The judges will check the reports of each team, assessing discounts as provided in a table of discounts, for all commissions by the team.

Unsafe Acts Discounted

6. Unsafe acts or practices by team members will be discounted.

7. A record will be kept of time consumed by each team in completing its inspection and report.

8. The team receiving the least number of discounts will be declared the winner.

9. Should two or more teams be tied for first place the team consuming the least time in making its inspection and returning its report will be given first place.

10. Competing teams will not be permitted to observe other teams working until after they have themselves completed their inspection and report.

11. The team will complete its inspection and submit its report to the judges and then each team member will take his position ready to pull tubing or hang rods in the derrick, at which time the gang pusher will report the work completed to the judges.

12. The pamphlet, Petroleum No. 1, "Unsafe Practices in Pulling Wells," will be used as the guide by the judges in determining unsafe acts or practices.

Discounts will be made for: failure to report any unsafe condition of derrick, power unit, lines, blocks, tools, etc., —2 points for each infraction; unsafe acts or practices by team members, —5 points for each infraction, and for receiving help from other than team members during the contest, —5 points for each infraction.

Entries are to be filed with Carl H. Martin, chairman of the inspection contest committee, International Petroleum Exposition, Tulsa. Entries must be made on or before October 1.

PALE OILS STRONGER

HOUSTON, Tex., Aug. 27.—A slightly more active demand in pale and red oils was evident in the Gulf Coast refinery market the past week which gave a more optimistic tone to the situation. There is no present indication that there will be any material strengthening of prices, which continued unchanged during the week. The demand, according to sellers, was due to a realization by buyers that prices now are about as low as can be obtained.

The fuel oil and gas oil situation continued very weak, although Tuesday there was no further lowering of quotations. The tanker situation still prevents the movement of these products in cargo lots to the East Coast to meet competition on the bunker market there.

OIL MONOPOLY RECEIPTS

According to the minister of finance, the Spanish petroleum monopoly is bringing in 100,000,000 pesetas annually. This capitalized at 5 per cent represented £60,000,000 at current rates of exchange.

H. V. FIELDHOUSE DEAD

CHATHAM, Ontario, Aug. 26.—H. V. Fieldhouse died recently in Wainwright. Mr. Fieldhouse was a lawyer, and took an active part in the early development of the Wainwright Field.

KEROTEST

EVERY VALVE PROVED DEPENDABLE BEFORE SHIPMENT . . .

RELIABILITY AND DEPENDABILITY ASSURED BY . . . . . .

OUTSIDE INDEPENDENT INSPECTION OF EVERY VALVE . . . .

THOUSANDS IN USE THROUGHOUT THE WORLD . . . . . .

EVENTUALLY YOU WILL STANDARDIZE ON KEROTEST, TOO, BECAUSE THEY'RE . . . . . .

SAFE, SATISFACTORY AND DEPENDABLE . . . . . .

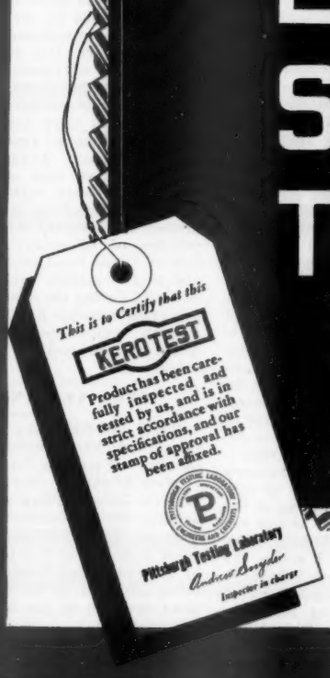
THEY ARE CARRIED IN STOCK, AND SOLD BY . . . . . .

OIL WELL SUPPLY COMPANY
Branch Stores in all Oil Fields

NORVELL-WILDER SUPPLY CO.
Houston, Beaumont, Shreveport, Fort Worth

Export Distributors
OIL WELL SUPPLY COMPANY
Pittsburgh, New York, Tampico, London

KEROTEST MANUFACTURING CO., PITTSBURGH, PA.


This is to Certify that this
KEROTEST
Product has been carefully inspected and tested by us, and is in strict accordance with specifications, and our stamp of approval has been affixed.
Pittsburgh Testing Laboratory
Inspector in charge

Of Interest to Sales Departments

Louisiana Company Enters Field of "One-Stop" Stations

SHREVEPORT, La., Aug. 24.—Success of the Firestone Tire & Rubber Co. in adding motor fuel, oils and greases to its station stocks is being watched by the automobile tire industry with the closest attention. The reverse of the proposition, refineries operating and controlling a string of filling stations going into the tire business, has an interest for the refiner fully as absorbing. Louisiana Oil Refining Corp. of Shreveport is the first refiner to venture into the "one-stop station" field so far as known.

Operating and controlling a string of 400 service stations and 75 wholesale stations in East Texas, Louisiana and Mississippi, and with an elaborate program for expanding this field under way, the company first became interested in tires as a division of its business—it is too large and too important an item to be called a side line—when it came to its attention that some of the controlled stations were handling tires as a side line and further inquiry disclosed that these rural roadside and urban corner dealers were doing an aggregate tire business of approximately $1,000,000 per year.

Two reasons for doing so became apparent upon further study of the proposition. The first of these can be explained simply as a step toward insuring the profitable operation of the dealers' service stations by offering them an allied line which can be stocked and marketed in the same building by the same personnel and at no increase in expense over that required for the operation of the ordinary service station.

The second reason suggested itself as a corollary to the first. It was logical that with a system of warehouses covering the territory, a distributing and an accounting system already perfected and functioning smoothly and facilities for rapid local transportation always available, the company was in good position to effect two very definite economies in handling such a line of automobile necessities as tires.

The first of these savings lay in warehouse construction and organization. The company already had a distributing organization equipped for the handling of tires on a large scale without any appreciable outlay for improvement or additions to meet the new demand whereas most tire companies are forced to maintain their own individual warehouses and warehouse personnel. So has every other refiner owning or controlling a wholesale and retail marketing system. The effect on the cost of the tire is obvious.

Possible Economies

The other economy is more directly traceable to the dealers' pockets. It is due to accessibility of bulk plants with their warehouses and trucks, which are available for storage and transportation of tires. This situation makes possible a larger dealer investment in the rapidly moving sizes of tires through removing necessity of tying up capital in stocks of slower moving sizes. A complete assortment of all sizes is always as close as the dealer's telephone.

The value of this feature also is self evident. The secret of profit of course is in frequency of turnover. The average dealer is handicapped by having to carry a stock of slow-moving sizes in order to meet the demands of all his trade. With a system of convenient, near-at-hand warehouse stocks, the deal-

(Continued on Page 388)

PIERCE CORPORATION WILL OPEN TWO LARGE HOTELS IN SEPTEMBER

The Pierce Petroleum Corp., which has completed a chain of terminals with restaurant and complete service station equipment, will open two large hotels at Rollo, Mo., and Columbia, Mo., next month. It is expected that the Rollo hotel will be completed early in September and the Columbia hotel later in the month.

The opening of the two hotels will mark another step in the Pierce plan which seeks to bring about a greater demand for its gasoline, lubricating oils and greases by offering the motorists high-class restaurant and hotel accommodations at convenient points along the main traveled highways.

The Pierce plan was inaugurated last year. At that time terminals were built at Rolla and Springfield, Mo. These terminals in addition to service station facilities, provided large restaurants. The first of August terminals with similar facilities were completed at Miami and Tulsa, Okla.

The Tulsa terminal, which is 6 miles from the business center of Tulsa, is shown in the accompanying photograph. The terminal represents an expenditure of approximately $250,000. The large building houses the restaurant, rest room and fountain accommodations. All of the second floor is given over to the restaurant. On the first floor are elaborate rest rooms, including a nursery and hospital facilities.

The service station for handling gasoline and lubricating oil is directly in front of the restaurant. To the left of the site is the building with accommodations for washing, greasing and tire service. The restaurant accommodations at the Tulsa terminal have proved to be especially attractive to motorists. In addition to the tourist trade a large number of Tulsa residents are patronizing the restaurant which has accommodations for over 200 guests.

Hotels similar to those under construction at Columbia and Rolla are to be built next year at the Tulsa and Miami terminals. A site for a terminal and hotel was recently purchased at Oklahoma City. In addition to the large terminals the Pierce corporation is building a combination service station and sandwich shop at St. Louis. The corporation plans to extend all of its facilities next year.

View of the recently completed terminal of the Pierce Petroleum Corp., at Tulsa. A large hotel is to be built next year to the rear of the restaurant.

Who's Who
IN PETROLEUM REFINING AND MARKETING

By C. O. Willson

Eighteenth of a series of articles describing briefly the operations of the major refining and marketing organizations in the United States.

Standard Oil Co. of Ohio

The Standard Oil Co. of Ohio is the oldest of the Standard units having been organized in 1870 by John D. Rockefeller and associates.

In its early history the products of its refineries were sold over a wide area. As other Standard refineries were built the sale of refinery output to a large extent was confined to the State of Ohio. With the dissolution in 1911 the company confined its refining and marketing activities to Ohio, this policy continuing until recent months.

In the past two years important changes have been made in the executive personnel of the Ohio Standard and this has been reflected in greater activity in both the manufacturing and sales departments. The rapid change in policy has caused wide comment in the industry.

The first refinery of the Standard of Ohio was at Cleveland and shortly after the World War a second plant was built at Toledo, Ohio. Early in the year the company took over a refinery at Latonia, Ky. This refinery which was completely rebuilt has a rated capacity of 5,000 bbls. daily.

The Toledo and Cleveland refineries early in the year were each given a rated capacity of 12,000 bbls. daily. Since that time additional improvements have been completed. Both plants have been modernized.

The Standard Oil Co. of Ohio is the largest marketer of gasoline and lubricating oils in the State of Ohio. The State is the third largest consumer of gasoline in the United States, the demand at present totaling approximately 3,000,000 gallons of gasoline daily. It is often said that Ohio is the "battle ground" in the marketing of refinery products and due to this fact the Ohio Standard has had difficulty in maintaining its dominant position in Ohio marketing.

Located between the oil operations of the West and East it has been the scene of activity for eastern companies expanding to the west and vice versa. At the present time gasoline refined as far west as the Mid-Continent and Gulf Coast and as far east as Bayonne, N. J., is being sold in Ohio. The East Coast encroachment includes gasoline refined in California refineries and brought east by water by way of the Panama Canal. Other Standard units as well as some of the large independent companies have expanded their market outlets into Ohio.

The building of the Latonia refinery has not only furnished a source of supply for the southern Ohio stations of the Standard of Ohio but will also enable the company to expand its marketing facilities to other states located along the Ohio River. The company since the first of the year has taken over a jobbing concern in Kentucky. With its refineries on the Great Lakes and the Ohio River plant the company is in a position to enter several other states with low transportation costs in the movement of its refinery products should it decide such a program is desirable.

TO ENFORCE GASOLINE STANDARDIZATION LAW

NEW YORK, Aug. 24.—Enforcement of New York State's new gasoline standardization law, passed at the last session of the State Legislature, will be undertaken by the Commissioner of Motor Vehicles September 1, and C. A. Hartnett, head of the commission, has appealed to the trade for co-operation in making the law effective. At a recent meeting held here Mr. Hartnett declared that enforcement of the gasoline standards law will be difficult because his department lacks both the machinery and funds necessary for this additional work.

Leading interests in the New York marketing field have promised co-operation in making the law effective, representatives of a number of companies having already conferred with Commissioner Hartnett on the question. At a meeting between the commissioner and representatives of oil companies, D. G. Delbridge head of the development department of Atlantic Refining Co., declared that less than one-half of 1 per cent of the gasoline sold in the State is below the standards established by the State. Other oil company representatives present at the meeting declared that even this small percentage of adulteration is accidental rather than intentional.

The gasoline standardization law has been in effect since June 1, but thus far there have been no reports of activity in its enforcement. Leading market interests, which at first opposed enactment of the law, later withdrew their objections and endorsed the measure, which will protect the industry itself from the competition of off-quality gasolines, which has at times constituted a serious menace to the market price structure, particularly during the summer months when low-grade gasoline has in years past been sold in competition with U. S. Motor quality motor fuel by some independent marketers.

OPEN VENDING KIOSKS

NEW YORK, Aug. 24.—The Autosales Corp. has completed installation of the first of its new "Autosalesshops," or vending kiosks, in four Standard Oil Co. of New Jersey filling stations at Philadelphia, Pa., Newark, N. J., and East Orange, N. J. Similar installations are being carried out for the same company in Baltimore and Washington filling stations, and will be extended to other stations operated by the New Jersey Standard company.

The new shop, designed like a minature Standard filling station, with tile roof, etc., is actually an automatic confectionery store, selling 20 articles, including candy, cigarets, biscuits and gum.

INTRODUCING...
PHILLIPS 66 ETHYL

Phillips 66 Ethyl—the famous gasoline of Controlled Volatility combined with the nationally known anti-knock fluid, Ethyl—is now available to jobbers on an attractive contract basis.

Here is a gasoline manufactured expressly for the season of the year and the geographical location in which your customers are located.

Here is a gasoline that combines instant starting, rapid acceleration, power, mileage, and no-knock performance—ALL IN ONE—a gasoline you have long wanted to fill a steadily increasing demand for a super quality motor fuel.

Phillips 66 Ethyl will win you new, steady customers—Wire, Phone, or Write for quotations.

Phillips 66 ETHYL

Phillips Petroleum Company

Bartlesville, Okla. Minneapolis, Minn.

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NATURAL GASOLINE FOR CONTROLLED VOLATILITY

Thermoid
"OIL DRILLER" BELTING

Specially Constructed for ***STRENGTH FLEXIBILITY and WEAR*** *under the hardest oil-field Service*

SOME THERMOID OIL FIELD PRODUCTS

Brake Lining.
Rotary Drill Hose
Transmission Belts
Balata Valves
Stuffing Box Rings
Rubber Sleeves, etc.

THERMOID RUBBER COMPANY *Factories and Main Offices,* TRENTON, N.J.

WILDCAT OPERATIONS IN OKLAHOMA

(Descriptions are East and North unless marked otherwise)

(Continued from Page 47)

HARMON COUNTY

I. T. I. O. Co.'s No. 1 fee, C SW SE S... 5-24w ...Rig.

HARPER COUNTY

Sinclair Oil & Gas Co.'s No. 1 Howell, C SW SW Sec. 14-26-24w .....Drlg. 2,425 ft.

HASKELL COUNTY

Holden's No. 1 Phillip, SE cor. Sec. 5-9-18e .....Drlg. 1,190 ft.
Marion Oil's No. 1 Sanders, NW NE SW Sec. 10-9-18e..Shut down 3,387 ft.
Sanboise Gas' No. 1 Unknown, SW NW SE Sec. 32-9-21e..Shut down 2,100 ft.

HUGHES COUNTY

American Oil & Ref. Co.'s No. 1 Ott, SE SW Sec. 15-5-11..Location.
Irwin et al's No. 1 Jones, SE NW Sec. 20-5-10 .....Rig on ground.
Canady et al's No. 1 Kanard, NW SW Sec. 30-9-12 .....Rig.
Whitney et al's No. 1 Moore, SE SW Sec. 17-5-9 .....Fishing 3,936 ft.

JACKSON COUNTY

Altus Oil Co.'s No. 1 Northington, NE cor. NE Sec. 4-1-20w .....Shut down 2,020 ft.

KINGFISHER COUNTY

Superior Oil Co.'s No. 1 Story, SE cor. Sec. 25-19-5w ....Drlg. 6,035 ft.
Galt Brown's No. 1 Wolf, NW SE Sec. 6-16-7w .....Drlg. 5,235 ft.
McKenna & Crawford's No. 1 Sturgeon, NE cor. SW Sec. 27-16-6w .....Shut down 4,895 ft.

KIOWA COUNTY

Dean & Adkinson's No. 1 Kent, NW cor. Sec. 6-5-14w ..Location.
Hyde et al's No. 1 Jones, SE cor. Sec. 23-3-18w-50 .....Shut down 490 ft.
S. H. Christian's No. 1 Stone, SE cor. Sec. 18-7-18w ....Rig on ground.
Merrick Oil Co.'s No. 1 Kelly, NW cor. SE Sec. 20-7-17w..Shut down 1,035 ft.
McWharter and others' No. 1 Sherwood, CWL NW NE Sec. 2-5-17w .....Shut down 1,100 ft.

LEFLORE COUNTY

Red Bank Oil Co.'s No. 1 fee, SE S... .....Drlg. 4,526 ft.

LATTIMER COUNTY

Limestone O. & G. Co.'s No. 1 Shaw, NW cor. NE NW Sec. 33-5-18e .....Rig.
Limestone Oil & Gas Co.'s No. 1 McMurray, SW cor. SW Sec. 15-5-18 .....Fishing 3,954 ft.

LINCOLN COUNTY

Morgan & Flynn's No. 1 Johnson, SW NE Sec. 1-16-5...Rig on ground.
Phillips Pet. Co.'s No. 1 Stephens, SE cor. NW Sec. 29-12-3 .....Drlg. 1,730 ft.

LOGAN COUNTY

Haley & Smith's No. 1 Guier, SE cor. SW Sec. 33-18-3w..Shut down 3,970 ft.

McINTOSH COUNTY

Western Natl. Gas's No. 1 Wells, CEL SE NW Sec. 15-11-17 .....Drlg. 500 ft.
Holden's No. 2 Phillips, C SE SE Sec. 2-9-18e .....Shut down 1,190 ft.
Spring Valley Oil Co.'s No. 1 Carr, SE cor. NE NW Sec. 16-10-13e .....Shut down 2,508 ft.
Patterson and others' No. 1 Smith, SW cor. NW SE Sec. 32-9-16 .....Shot 240 qts. 5,446-5,559 ft.; shot went off up hole; fishing.

MAJOR COUNTY

Earl and others' No. 1 Turner, C NE NE Sec. 23-20-14w..Rig.
Wilson and others' No. 1 Unknown, NE cor. NE Sec. 4-23-16w .....Shut down 510 ft.

MUSKOGEE COUNTY

Sioux Oil Co.'s No. 1 Unknown, NW SE Sec. 21-11-19 ...Shut down 300 ft.
Cooper-Badget's No. 1 Young, NW NE NE Sec. 7-12-20e..Shut down 50 ft.

NOBLE COUNTY

Peerless et al's No. 1 Wentz, NW SW Sec. 22-22-1 .....Location.
Blackwell O. & G. Co.'s No. 1 Foster, C NE NE NW Sec. 8-22-1w .....Abandoned 1,000 ft.
Gypsy Oil Co.'s No. 1 Bailey, C NE NE Sec. 24-22-1e ..Drlg. 4,343 ft.
Magnolia Petroleum's No. 1 King, C SE SW Sec. 26-20-1w..Drlg. 4,208 ft.

OKFUSKEE COUNTY

Henry Oil Co.'s No. 1 Smith, NW cor. Sec. 35-12-9 .....Location.
Shepard et al's No. 1 Neveas, SE NW SW Sec. 3-12-10 ...Spudding.
Superior and others' No. 1 Carolina, SE cor. Sec. 6-11-7e .....Fishing 2,859 ft.

OKLAHOMA COUNTY

Ryan & Martin's No. 1 Lawton, NE NW Sec. 3-11-2w ..Rig.
Tom Slick Oil Co.'s No. 1 Martin, C NW NW Sec. 13-13-1w .....Drlg. 2,640 ft.
Mid-Kansas' No. 1 Trosper, NE NW Sec. 19-12-1w .....Drlg. 6,775 ft.
Hall & Briscoe's No. 1 Holmes, NE cor. SW SE Sec. 10-11-3w .....Shut down 4,750 ft.

PITTSBURG COUNTY

Galbreath's No. 1 Snyder, C W half SW Sec. 28-4-13 ....Shut down 100 ft.
Empire O. & R. Co.'s No. 1 Williams, C NE SE Sec. 33-7-16e .....Rig.
Kerr & Koy's No. 1 Hall, C NW NW Sec. 32-4-13 .....Underreaming 8-in. csg. 2,406 ft.

PONTOTOC COUNTY

Indian Territory Illuminating Oil Co.'s No. 1 McFarland, NW cor. Sec. 4-5-5 .....Location.
Indian Territory Illuminating Oil Co.'s No. 1 Shoate, C NE SE Sec. 1-4-4 .....Location.

POTTAWATOMIE COUNTY

Empire O. & R. Co.'s No. 1 McKown, SW NW Sec. 25-8-4 .....Rig on ground.
Keister & Manning's No. 1 Tibbs, NE SW Sec. 9-8-4 ....Drlg. 1,410 ft.
Amerada's No. 1 Vineyard, NW NE NE Sec. 15-7-3 .....Drlg. 4,140 ft.
Gypsy Oil Co.'s No. 1 Randosh, NW NE Sec. 23-6-4 .....Fishing 3,762 ft.
Frank Moore's No. 1 Fundis, SE NE Sec. 19-7-3 .....Location.
Phillips Pet. Co.'s No. 1 King, NW cor. Sec. 26-8-4 .....Drlg. 4,030 ft.
Sinclair and Mid-Continent's No. 1 Cumings, SE NE SE Sec. 6-7-5 .....Abandoned 4,460-70 ft.; water.
Shaffer and Margay's No. 1 Murphy, NW NE Sec. 11-6-3 .....Drlg. 3,981 ft.
Cal-Cul Oil Co.'s No. 1 McKnight, NW cor. NE NW Sec. 9-8-3 .....Drlg. 3,820 ft.

ROGER MILLS COUNTY

Busy & Stone's No. 1 William, C SW Sec. 23-12-24w ....Abandoned.
L. C. Hivick's No. 1 Davis, C NW NE Sec. 4-11-26w ....Shut down 1,300 ft.

SEMINOLE COUNTY

Sunray Oil Co.'s No. 1 Sunday, NW SE Sec. 26-5-5 ....Location.
McCullough Oil Co.'s No. 1 Luckett, NE NW Sec. 23-10-5..Drlg. 2,760 ft.
Prairie & Slick's No. 1 Bettsey, NW SW Sec. 36-6-6 ....Rig.
Harris' No. 1 Harjocke, SE NE SE Sec. 8-6-6 .....Spudding; shut down.
Prairie's No. 1 Mingo, NW NE Sec. 25-6-6 .....Drlg. 2,363 ft.

SEQUOYAH COUNTY

Hunt and others' No. 1 Unknown, SE cor. NW SW Sec. 12-12-23 .....Drlg. 1,200 ft.
Buffington and others' No. 1 Melcher, C SW NW Sec. 31-12-24 .....Shut down 3,000 ft.

WOODS COUNTY

Peerless O. & G. et al's No. 1 Cromwell, SW SE Sec. 14-28-16w .....Drlg. 900 ft.
S. K. Miller's No. 1 Copenhavers, NW cor. NW Sec. 18-24-13w .....Rigged up and shut down.
Gypsy-Prairie and others' No. 1 Thompson, SE cor. SW Sec. 10-25-15w .....Drlg. 5,785 ft.
Sinclair Oil & Gas Co.'s No. 1 Steward, C SW SW Sec. 33-27-16w .....Drlg. 5,105 ft.

WOODWARD COUNTY

Farrend et al's No. 1 Unknown, SE cor. SW SE Sec. 2-23-17w .....Shut down 1,387 ft.
Prairie Oil & Gas Co. and others' No. 1 James, NE cor. NW Sec. 33-22-17w .....Drlg. 5,020 ft.
Billy's Oil Co.'s No. 1 Watt, C SE Sec. 9-22-20w .....Drlg. 3,955 ft.
Burgoyne Brothers' No. 1 Merkins, SW cor. SE NE Sec. 15-21-19w .....Shut down 1,910 ft.

Four 250-Bbl. Maloneys used by T. B. Slick on the Jones Lease, Seminole, Okla.

Maloney *Vapor-Pressure* Tanks Insure Highest Prices for Your Oil . . . .

Scientifically conducted tests, made by the U. S. Bureau of Mines and others, show conclusively that evaporation losses from lease tanks are materially reduced when such tanks are equipped to hold vapors up to 14 or 16 ounces of pressure and are painted in light colors to reduce temperature variations. Consequently such tanks are effective in maintaining the gravity of crude oil.

MALONEY *"Vapor-Pressure"* Flow and Stock Tanks—constructed and equipped for operation under approximately 16 ounces of pressure, and painted with Maloney Special pearl gray paint—enable operators to maintain the gravity of crude oil on the lease, and thus insure highest prices for the oil.

The Maloney Tank Mfg. Co. announces Bolted Steel Tanks conforming with A. P. I. dimensional standards and carrying the official A. P. I. monogram.

Maloney Features:

1. Made of rust-resisting Keystone Copper Steel.
2. Maloney patented close-fitting "crimp" seams and joints.
3. Maloney pliable rubber gasketing and Gaso cement.
4. All seams, including deck seams, reinforced with rigid steel channels.
5. Special bolts of 90,000 pounds tensile strength.
6. Large cleaning out plates set flush with bottoms.
7. Howell Aluminum "4-in-1" Vacuum Pressure Valve and Thief Hatch.
8. Maloney special pearl gray paint.
9. Sizes 12 to 10,000 barrels.
10. Packed in steel bound crates for export.

"Alone in Quality"

MALONEY TANK MFG. CO.

Tulsa, Okla., U.S.A.

Distributers at All Principal Petroleum Points.

AMERICAN

MALONEY PATENTED BOLTED COPPER-STEEL TANKS

MALONEY ALONE

High Pressure

Saddle Clamp

This clamp is recommended for high pressure main line work. Built like an Emergency Pipe Clamp—vastly oversize. The Skinner principle of a hinge on one side, bolts on the other is used. Can be had either "blind" or tapped for outlet.

Each side of the clamp has a pressure platform to concentrate heavy, even pressure on the gasket—and nowhere else. Binding is impossible. Thus when a very thick gasket is needed, it can be used. *Write for catalog.*

M. B. SKINNER CO.

Sample Street at Falcon Street
SOUTH BEND, IND.

SKINNER BAND CLAMP

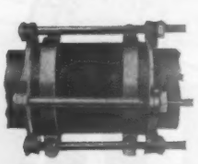
EMERGENCY PIPE CLAMP

SKINNER SERVICE SADDLE

SKINNER PIPE LINE CLAMP

SKINNER PIPE JOINT CLAMP

SKINNER H. P. SADDLE CLAMP



SKINNER COLLAR LEAK CLAMP

SOUTHERN OKLAHOMA

BRYAN COUNTY

Marshall et al's No. 1 fee, SE NW NW Sec. 26-5s-7 ....Drlg. 571 ft.
Wheeler & Wiley's No. 1 Pitts, NW cor. Sec. 36-6s-9e ..Abandoned 832 ft.
Yale Oil Syndicate's No. 1 Craige, C NW NE Sec. 36-9s-9e .....Drlg. 1,700 ft.

CARTER COUNTY

L. J. Woodruff's No. 1 Zellnear, NE cor. NW SE Sec. 34-4s-1 .....Drlg. 2,130 ft.
Avon-Dickey's No. 1 Anderson, NE cor. SE NE SE Sec. 32-4s-2 .....Shut down 420 ft.

CHOCTAW COUNTY

Dean & Adkinson's No. 1 Kent, NW cor. Sec. 6-5s-14 ...Location.
Choctaw Petroleum Co.'s No. 1 Wilson, SW cor. SW Sec. 15-6s-9 .....Shut down 1,346 ft.

COMANCHE COUNTY

Bridwell Oil Co.'s No. 1 Porter, NE SE SE NW Sec. 17-1s-11w .....Rig on ground.

COTTON COUNTY

Fain & McGaha's No. 1 Mason, NW SW SW Sec. 29-4s-11w .....Drlg. 3,199 ft.
Amerada Pet. Corp.'s No. 1 Dulaney, SE cor. NW NW Sec. 31-4-9w .....Abandoned 3,348 ft.

JEFFERSON COUNTY

Danciger et al's No. 1 Dilley, SE NW Sec. 11-5s-7w ....Rig.
Gypsy Oil Co.'s No. 1 Smith, C SW SE SE Sec. 2-7s-7w..Rig.
Pierce & Brown's No. 1 Fisher, SE SW Sec. 13-6s-7w ..Drlg. 2,350 ft.
J. A. Porter's No. 1 Paddock, NE NW NE Sec. 35-5s-7w..Drlg. 2,659 ft.

JOHNSTON COUNTY

Smith & Knisely's No. 1 Lane, E half Sec. 29-1s-7 ....Shut down 2,990 ft.

MARSHALL COUNTY

Neif & Sneed's No. 1 Goff, SE NE SE Sec. 21-7s-5 .....Abandoned 701 ft.

McCURTAIN COUNTY

Utopia Pet. Co.'s No. 1 Unknown, SE NW Sec. 14-9s-25 ..Location.
Milton et al's No. 1 Vase, SW NW Sec. 26-6s-21 .....Shut down 1,005 ft.

STEPHENS COUNTY

Pace and others' No. 1 Woolsey, SE SW NE Sec. 4-3s-6w .....Shut down 2,261 ft.
Porter & Monahan's No. 1 Robberson, SE NW Sec. 23-3s-4w .....Rig.

TILLMAN COUNTY

Cochran & Ridgway's No. 1 Barnes, C NW NE .....Cellar.
Landfair and others' No. 1 Smith, SE SW SE Sec. 6-2s-15w .....Shut down 2,535 ft.
Allen & Treadwell's No. 1 Howell, NW cor. SE Sec. 13-1-17w .....Abandoned 840 ft.

OKLAHOMA PANHANDLE

Skaer's No. 1 Hitch, NW cor. Sec. 25-1-15e .....Shut down 250 ft.

WILDCAT OPERATIONS IN KANSAS

(Descriptions are East unless otherwise marked)

(Continued from Page 48)

GREENWOOD COUNTY

F. Konkay et al's No. 1 Rock, NW NE NE Sec. 7-27-12..Shut down.
Ward & McGinnis' No. 1 Anderson, NE NW SW Sec. 13-25-10 .....Drlg. 1,400 ft.

HARPER COUNTY

Tom Slick Oil Co.'s No. 1 Miller, SE cor. Sec. 13-34-8w .....Drlg. 4,560 ft.
Tom Slick Oil Co.'s No. 1 Thompson, NW cor. Sec. 19-32-6w .....Drlg. 4,606 ft.
Independent & Reserve Oil Co.'s No. 1 Moulds, C NE Sec. 7-24-1w .....Fishing 2,600 ft.

HARVEY COUNTY

Liggett et al's No. 1 Regier, C SE NW SE Sec. 2-23-3w..Rig.
Payne and others' No. 1 Ady, NE NW SE Sec. 16-24-1 ....Drlg. 2,155 ft.
Deering-Marshall's No. 1 Dick, Sec. 4-25-2w .....Drlg. 3,070 ft.
McCulloch et al's No. 1 Prouty, NW cor. SW Sec. 3-23-1w .....Fishing 2,020 ft.
Roth & Parrent's No. 1 Brombrowsky, NW cor. Sec. 26-22-1e .....Drlg. 3,040 ft.
Mrs. Gay et al's No. 1 Grove, C NW NE NW Sec. 29-23-1w .....Shut down 3,102 ft.
Jolly & Ogg's No. 1 Randall, NE cor. NE Sec. 11-24-1w ..Shut down 2,444 ft.
Rosenthal et al's No. 1 Ingalls, C NW SW Sec. 24-23-3w..Drlg. 3,605 ft.
Jolly & Ogg's No. 1 Hupp, SE cor. NE Sec. 22-23-1w ....Fishing 3,220 ft.

HODGEMAN COUNTY

Phillips Pet.'s No. 1 Hausman, NW NE Sec. 30-22-22w ..Drlg. 1,600 ft.

JEFFERSON COUNTY

Wichita Oil Co.'s No. 1 Simpson, NW cor. SW SW Sec. 19-10-17 .....Rigged up and shut down.

KIOWA COUNTY

British-American's No. 1 Woodward, NE cor. Sec. 35-27-17w .....Drlg. 4,387 ft.
British American-M. M. Valerius, NE cor. Sec. 35-27-17w..Location.

KINGMAN COUNTY

White Eagle's No. 1 Lorenz, C NE SW SE Sec. 25-27-5w..Rig on ground.
Gypsy Oil Co.'s No. 1 Kincaid, NE cor. NW Sec. 18-29-5w .....Siliceous lime 4,513-23 ft.; fishing.

LANE COUNTY

Robinson's No. 1 Dickerson, Sec. 11-18-27w .....8-in. csg. 2,625 ft.
Blankenship Pet. Co.'s No. 1 Schaeffer, NE cor. NE Sec. 24-16-28w .....Spudded and shut down.

LYON COUNTY

Blair et al's No. 1 Martindale, C NW NE NE Sec. 27-21-11 .....Drlg. 1,606 ft.
Gordon & Stats' No. 1 Murphy, NW NE Sec. 32-21-11 ....Drlg. 1,625 ft.

MARSHALL COUNTY

Irwin et al's No. 1 Cooper, NE NW Sec. 10-3-7e .....Shut down 2,240 ft.

MARION COUNTY

White Eagle's No. 1 Voker, NE NW Sec. 24-17-2 .....Rig on ground.
American O. & R. Co.'s No. 1 Urie, NW SW NW Sec. 10-17-3 .....Rig.
Empire's No. 1 Reising, NE NW NW Sec. 34-20-2 .....Rig.
Davis et al's No. 1 Bartel, SE NE Sec. 1-19-1 .....Spudding.
Shell Pet. Corp.'s No. 1 Scully, NW NE Sec. 34-18-2e ....6-in. csg. 2,640 ft.
Hobworth et al's No. 1 Skiles, SE NW NW Sec. 30-21-3e..Drlg. 2,198 ft.

McPHERSON COUNTY

McPherson O. & G. Co.'s No. 1 Sorenson, C SE Sec. 23-18-2w .....Rig.
Lario et al's No. 1 Diener, SE SW Sec. 10-20-1w .....Drlg. 550 ft.
Perry et al's No. 1 Wade, C SE Sec. 20-19-4w .....Rig.
E. W. Marland's No. 1 Swanson, NE SW NE Sec. 36-18-4w..Drlg. 2,560 ft.
Slick, Pryor & Lockhart's No. 1 Gratton, C NE NW NW Sec. 34-20-3w .....Fishing 2,150 ft.
Helmerich & Payne's No. 1 Klassen, SE NE NE Sec. 14-21-1w .....Shut down 2,390 ft.
McPherson Gas Co.'s No. 1 Chinberg, NW cor. Sec. 18-19-2w .....Casing landed at 3,045 ft.
McPherson O. & G. Co.'s No. 1 Rasmusson, SW cor. Sec. 8-18-3w .....Drlg. 2,600 ft.
Ted Washabaugh's No. 1 Vosshell, NE cor. NE Sec. 9-21-3w .....Fishing 3,301-04 ft.; show of oil; skid rig.
J. H. Tatlock's No. 1 Hayer, C SW NE Sec. 32-20-1w ..Wilcox 3,474-79 ft.; water: shut down; total depth 3,512 ft.

MORTON COUNTY

White & Cheney's No. 1 Unknown, NE cor. Sec. 11-34-42w .....Rig on ground.

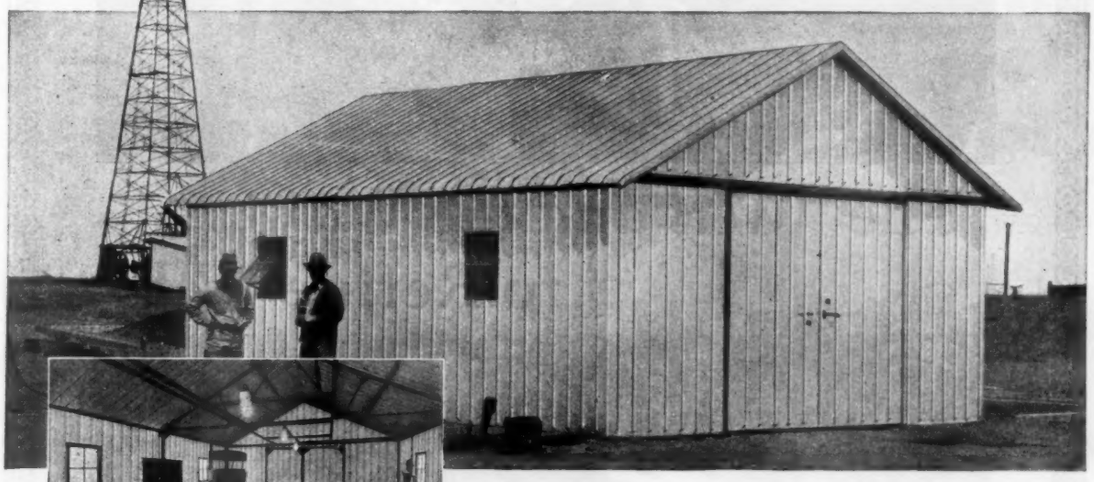
NESS COUNTY

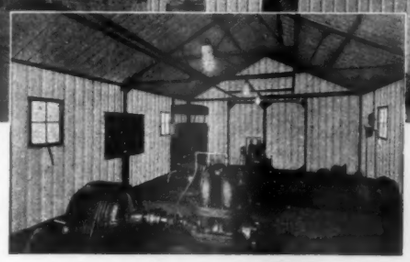
E. W. Marland, Inc.'s No. 1 Moses, NE SE Sec. 7-18-25w..Drlg. 3,500 ft.

OSAGE COUNTY

Goebel-Bending's No. 1 Bartee, C SW SW Sec. 28-17-15..Drlg. 1,215 ft.

For Pipe Line Operations





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The pulsating power that "pushes" oil over hills, down valleys, across streams and under rivers—through the criss cross work of the Nation's pipe lines—logically finds shelter in steel buildings.

Particularly is this true of Butler Ready-Made Steel Buildings in which pipe line operators find available such vital advantages as—

Fire safeness to offset the lack of fire protection at outpost stations.

Complete materials, ready made and readily transported to whatever site power needs make necessary.

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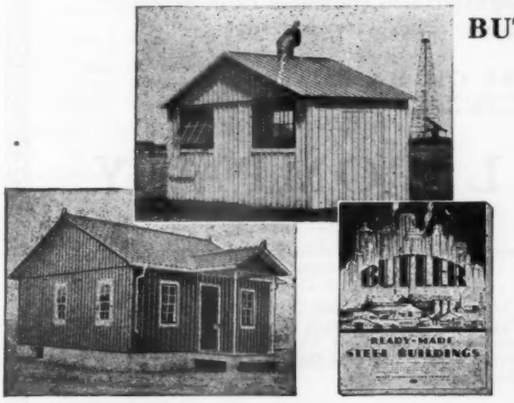
Structural qualities which insure permanence, yet which permit enlarging or taking down and re-erecting without loss of anything more than a few dropped bolts.

In Butler Ready-Made Steel Buildings, unique shaping multiplies the strength of steel. Throughout the maximum strength per pound is attained.

A new booklet pictures many installations of Butler Ready-Made Steel Buildings to serve all branches of the oil industry. Send for it and call upon Butler engineers to supply full details and prices on any type of structure in mind.



BUTLER MANUFACTURING COMPANY

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944 6th Ave. S.E., MINNEAPOLIS, MINNESOTA

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The "*Will and the Way*" to Refine Well

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And because The Pure Oil Company controls *every* step in producing and refining its products, you are assured of *uniform* quality . . . delivery on the dot.

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Conducted by Edwin Franko Goldman
Every Tuesday Night over WJZ and chain

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OSBORNE COUNTY

Phillips Pet. Co.'s No. 1 Greive, NW SE NE Sec. 6-7-12w..Drlg. 2,265 ft.
Mid-Kansas' No. 1 Boyce, SE cor. NW Sec. 18-6-13w ..Drlg. 2,150 ft.
Trees Oil Co.'s No. 1 Payenter, NE cor. SE SE Sec. 22-6-15 .....Drlg. 3,368 ft.

PAWNEE COUNTY

F. C. Troupe's No. 1 Lovett, CEL NE NE Sec. 31-21-16w.Shut down 1,560 ft.

PHILLIPS COUNTY

Watsonian-British American's No. 1 Wellman, C SW SW Sec. 34-3-19w .....Drlg. 3,720 ft.

PRATT COUNTY

O'Haver & Jones' No. 1 Lunt, C SW NW Sec. 15-28-14w..Drlg. 3,515 ft.

RENO COUNTY

Wilson et al's No. 1 McPhaeters, C S half NW Sec. 22-26-8w .....Rig.
Witt's No. 1 Olsen, C SE NW Sec. 14-22-6w .....Rig.
Skelly Oil Co.'s No. 1 Birkett, NE SW Sec. 30-24-7w ....Drlg. 3,065 ft.
Milmar Oil Co.'s No. 1 Strickley, SW cor. SW Sec. 17-26-5w .....Drlg. 3,354 ft.

RICE COUNTY

Derby Oil Co.'s No. 1 Johnson, C NW NE SE Sec 24-20-6w .....Drlg. 1,055 ft.
Milmac's No. 1 Cain, C SE Sec. 29-19-7w .....Shut down.
Allison & Fitzwilliams' No. 1 Poland, NE cor. SW NE Sec. 36-19-8w .....Cellar.
Higgins & Steinbuchel's No. 1 Shurr, NE cor. SW Sec. 21-20-10w .....3,278-80 ft.; 100 bbls. showing; testing by swabbing; shut down.

RILEY COUNTY

Grey et al's No. 1 Smith, NE SE Sec. 30-6-6 .....Drlg. 1,930 ft.
Derby & Shaw's No. 1 Lindstrom, NE cor. Sec. 32-7-5e ..Drlg. 2,056 ft.

RUSSELL COUNTY

Prairie Oil & Gas Co.'s No. 1 Brungardt, C NW SE NW Sec. 31-12-16w .....Drlg. 360 ft.
Empire and Prairie's No. 1 Bocks, C SE NE NE Sec. 23-15-14w .....Drlg. 925 ft.
Allison & Fitzwilliams' No. 1 Mohenny, NW SE Sec. 5-14-12w .....Drlg. 3,354-81 ft.; water; aband.

ROOKS COUNTY

Kruger et al's No. 1 Stela, NW SE SW Sec. 12-9-16w ..Shut down 50 ft.
Burford-Brim's No. 1 Toxa, Sec. 22-9-17w .....Spudded; shut down.

RUSH COUNTY

Sinclair Oil & Gas Co.'s No. 1 Seur, C SW NW NW Sec. 8-18-17w .....Drlg. 3,768-70 ft.; water.
Danciger Oil Ref. Co.'s No. 1 Swindt, SW cor. Sec. 32-17-17w .....Fishing 3,755 ft.
Central Commercial Oil Co.'s No. 1 Brock, SE cor. SW SW Sec. 12-17-16w .....Shut down 50 ft.
Danciger Oil Ref. Co.'s No. 1 Pivonka, NE cor. SW NE Sec. 17-19-17w .....Drlg. 3,785 ft.

SALINE COUNTY

Dixie Oil Co.'s No. 1 Thorstenburg, NW NE Sec. 10-16-3w .....Drlg. 700 ft.
Austin et al's No. 1 Olsen, NW SW SE Sec. 10-15-4w ..Shut down.
Templeman's No. 1 Lanbengager, C SW Sec. 20-15-5w ..Drlg. 2,535 ft.
Twin Mounds' No. 1 Weis, NW NE NW Sec. 20-13-4w .....Drlg. 300 ft.
Dixie Oil Co.'s No. 1 Muir, C SW SE Sec. 4-15-2w .....Shut down 3,126 ft.

SEDGWICK COUNTY

Fleeger D. F.'s No. 1 Ottaway, C SW NW Sec 16-28-2w..Rig.
C. B. Davis' No. 1 Kinkead, NE cor. Sec. 14-27-1 .....Drlg. 2,360 ft.
Mariand and Amerada's No. 1 Sensroth, NW cor. Sec. 36-28-4w .....Drlg. 1,500 ft.
Boyle's No. 1 Sandusky, NW NE SE Sec. 34-26-1w ..Drlg. 1,590 ft.
Lario O. & G. Co.'s No. 1 Calkins, SW cor. SE Sec. 7-27-2e .....Drlg. 2,965 ft.
E. W. Mariand's No. 1 Huggins, SE NW SW Sec. 30-27-2 .....Drlg. 2,320 ft.
Johnson & Marshall's No. 1 Roy, NE cor. SE SW Sec. 23-29-1w .....Drlg. 3,420 ft.
Lario O. & G. Co.'s No. 1 Teachorff, NE cor. SW Sec. 27-29-1w .....Drlg. 2,800 ft.
Kyle et al's No. 1 Pinney, SW NW SE Sec. 29-28-1w ....Shut down 50 ft.
T. B. Slick's No. 1 Rosenhagen, SW SE NE Sec. 33-27-4w .....Wilcox sand 4,186-91 ft.; water; total depth 4,343 ft.; aband.
Hammond & Stout's No. 1 Roeder, SW NW Sec. 23-27-2w .....Drlg. 4,040 ft.
Twist et al's No. 1 Armstrong, NE NW Sec. 28-26-1e ...Rig; spud.; shut down.
Barnett O. & G. Co.'s No. 1 Davidson, NW cor. NW SW Sec. 27-26-1e .....Shut down 2,668 ft.
Kellar & Lewis' No. 1 Buckles, NW cor. SE Sec. 3-28-1w..Fishing 975 ft.
Twist et al's No. 1 Joseph, CNL SW SE Sec. 4-25-1w ....Shut down 1,980 ft.
Miller Wents' No. 1 Shaffer, NE cor. NW Sec. 9-27-2w ....Viola 4,012-18 ft.; water; aband.
Washabaugh et al's No. 1 Harrison, NW cor. NE NE Sec. 3-26-2w .....Drlg. 2,630 ft.
LaFont et al's No. 1 Carlton, C SE SE SW Sec. 24-28-1e..Shut down 1,685 ft.

SHERMAN COUNTY

A. L. Henson et al's No. 1 Murry, NE cor. SE NW Sec. 33-7-40w .....Shut down 3,035 ft.

STEVENS COUNTY

Trees Oil Co.'s No. 1 Thompson, C NE SW Sec. 3-35-38w..Shut down 500 ft.
W. Sidwell et al's No. 1 Kelly, SW cor. NE Sec. 16-34-38w .....Shut down 1,320 ft.

SMITH COUNTY

Phillips Pet.'s No. 1 Clydesdale, SE NW Sec. 23-5-14w ....Drlg. 2,200 ft.

SUMNER COUNTY

Lario O. & G. Co.'s No. 1 Henderson, NW SW Sec. 21-30-1w .....Rig.
E. K. Carey & Larado Oil Co.'s No. 1 Welsch, SW SE Sec. 9-34-1e .....Drlg. 2,120 ft.
Mid-Continent Pet. Corp.'s No. 1 Clark, SE cor. Sec. 31-34-3w .....Drlg. 3,540 ft.
Shell Pet. Corp.'s No. 1 Armstrong, NE cor. Sec. 12-33-1e.Drlg. 345 ft.
Gypsy & Blankenship's No. 1 Robeck, C SW SW Sec. 27-34-4w .....Drlg. 4,890 ft.
Davidson et al's No. 1 Strickland, SW cor. SE Sec. 12-35-1w .....Rig.

TREGO COUNTY

Prairie Oil & Gas Co.'s No. 1 Kutina, C NE SW NE, Sec. 29-15-21w .....Rig.
Phillips Pet. Co.'s No. 1 Spitz, SE cor. Sec. 24-12-25w....Rig on ground.
Mid-Kansas' No. 1 Ridgeway, NE SW Sec. 28-12-21w ....Drlg. 1,580 ft.
Day et al's No. 1 Gugler, SW NE NE Sec. 36-12-21w .....Shut down 50 ft.
Day et al's No. 1 Unknown, NE NW SW Sec. 2-11-21w ....Shut down 2,910 ft.

WASHINGTON COUNTY

McCool & Vincent's No. 1 Linn, NW cor. NE Sec. 27-4-3..Drlg. 2,300 ft.

WALLACE COUNTY

Morton & Entyre's No. 1 Parker, SE cor. NW SW Sec. 20-13-41w .....Rig.

WILDCAT OPERATIONS IN NEBRASKA

FRANKLIN COUNTY

U. R. Drlg. Co.'s No. 1 Brunkle (twin well), C NW SW NE Sec. 2-3n-13w .....Rig.

CHASE COUNTY

Chase Pet. Co.'s No. 1 Ingold, C NE Sec. 24-5n-33w ....Total depth 4,050 ft.; cementing 6-in. csg.

FURNAS COUNTY

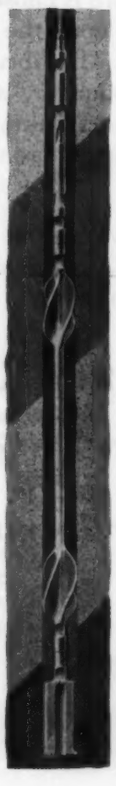
Southwestern Pet. Corp. of Nebraska's No. 1 Montague, SE SW SW Sec. 28-1n-22w .....Drlg 1,750 ft.
Graham Bros.' No. 1 Edwards, NW SW Sec. 13-2n-22w..Shut down 3,150 ft.

WEBSTER COUNTY

Mid-States Exploration Co.'s No. 1 Platt, C SE one-half Section 3-1n-11w .....Shut down 555 ft.

The question of elimination of crooked holes is foremost in the minds of operators.

Use spiral stems manufactured by the Titusville Forge Co., and you will eliminate this question once and for all.



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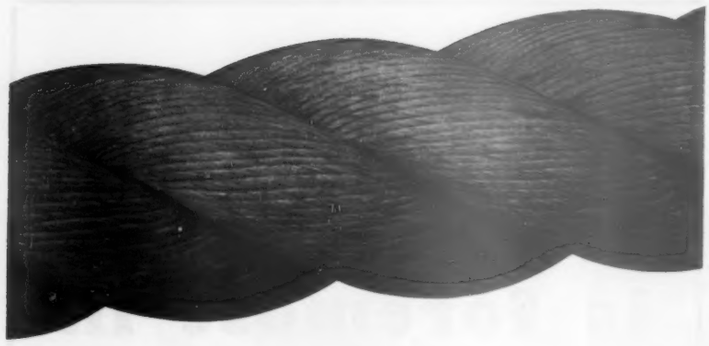
TITUSVILLE FORGE COMPANY
TITUSVILLE, PENN.



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The excellent quality in Columbian Bull Rope, Columbian Manila Drilling Cable, Columbian Manila Cathead line or any other kind of Columbian oil well cordage speaks for itself in terms of long, dependable service.

Special fibre is chosen for each type of line, depending upon the use to which it will be subjected. The fibre is made into the completed product by a company whose long experience in making cordage to best fit the drillers' needs, assures correctness and satisfaction.

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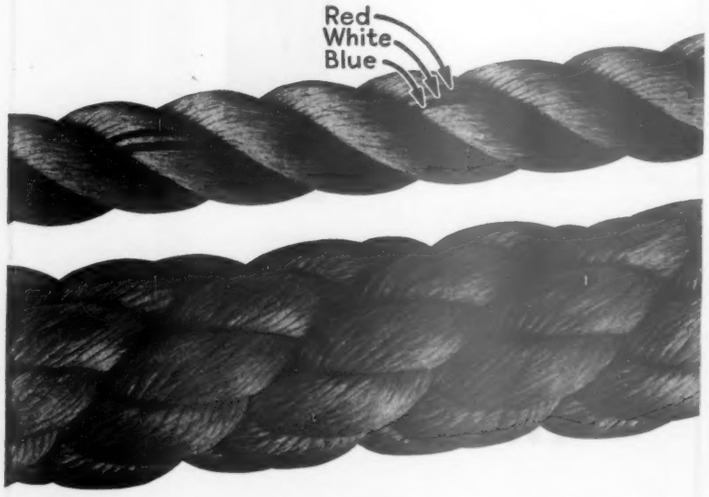

PIPE LINES TRANSPORT NATURAL GASOLINE

(Continued from Page 34)

take starts from the Shell's Ventura Avenue natural gasoline plant at an elevation of 500 feet above sea level. This plant incidentally is one of the largest single units in operation with a daily capacity of 150,000 gallons being exceeded only by one other installation in California. Before leaving the field however the line takes a sheer drop of 250 feet at an agle of 45 degrees and then almost immediately climbs up to an elevation of 1,009 feet before dropping down into Hall's Canyon located in the extreme eastern part of the field. After leaving Ventura Avenue the next and highest elevation 1,620 feet above sea level, is reached at Santa Susana Pass located 44 miles southeast of the field and approximately 53 miles northwest of Los Angeles Harbor. In the first 15 miles after leaving the Ventura Avenue Field the line drops down to approximately 100 feet above sea level at Saticoy before starting its consistent upward climb to the peak at Santa Susana Pass which is reached 30 miles further on. The line drops off almost vertically at Santa Susana after the peak has been reached as a loss in elevation of about 700 feet is sustained before another mile has been reached. The next range crossed by this remarkable line is reached 17 miles beyond Santa Susana Pass and both the ascent and descent are quite rapid. From a low of about 650 feet the line attains an elevation of 1,300 feet in less than two miles in crossing this range, the Santa Monica Mountains, and then drops almost 1,300 feet in the following 10 miles. From this point on into the Wilmington refinery, a distance of 23 miles, the terrain is relatively gentle.

Different Sizes of Pipe

Two different sizes of pipe were found necessary in order to develop the proper hydraulic gradients at the elevations over which the line passes. Steel slip joint pipe has been used in the construction of this project, 81 miles being 4-inch and the remaining 16.5 miles, 6-inch. The joints average 40 feet in length. the 4-inch weighing 7.12 pounds per foot and the 6-inch 10.2 pounds. One of the most interesting features in connection with this installation is the fact that it operates almost entirely automatically. The control device installed in the Shell's automatic pump station at Simi is exceptionally interesting both from an engineering and operating standpoint. It consists of a boiler riveted steel pressure tank attached to which are four float cages. Two of these floats are set to operate a mercury switch which starts and stops the motor automatically, the other two floats being connected to ball bearing throttle valves, one on the suction line and one on the discharge line. These valves and floats are so set that a constant governable quantity of liquid is kept moving through the automatic Simi pump station at all times. When the Ventura pump shuts down, the Simi pump automatically stops as the entire system is one of liquid level control. This automatic control is also obviously of great value in the event of a line break as it minimizes the possibility of feeding natural gasoline into a broken pipe line. Great care was exercised in the construction of the line in order to reduce leakage to a minimum and eliminate pipe line breaks as far as possible. The entire line was tested hydraulically to 1,000 pounds per square inch after being placed in the trench. It is well insulated and is buried from two to four feet. Two pumps are used in the operation of the Shell's line, one being located at Ventura Avenue and one at the Simi pump station, the former being driven by a steam turbine and the latter by electrical energy.

The Shell Co. constructed this line in 33 actual working days at a cost of less than $1,000,000. One of the most remarkable features in connection with this line is the fact that it has paid for itself many times over since completion as a result of economies affected through the elimination of a 100-mile railroad haul and the reduction of evaporation losses to a minimum. The Shell's project is necessarily a high pressure line and while one would naturally expect an average loss of around 2 per cent, the actual measured loss is considerable under 1 per cent. The Simi pump station was originally designed and constructed to handle 140,000 gallons per day under a pressure of 600 pounds but it has been operating under a pressure of 700 pounds. The last check made showed 155,000 gallons of natural gasoline passing through the Simi pump station daily. This is at the rate of 6,400 gallons per hour or roughly 107 gallons per minute. This line has been in continuous operation for approximately two years and has handled something like 2,000,000 bbls. of natural gasoline during this period.

Union's System

The Union Oil Co. has a very comprehensive pipe line system for the transportation of natural gasoline in Los Angeles basin and a detailed check indicates that it is one of the most efficient lines in operation at the present time. Approximately 400 000 gallons of natural gasoline is handled through this system daily with an average loss of about one-half of one per cent. Starting from the east side of Los Angeles basin the Union's line runs from the Richfield district northwest to Santa Fe Springs thence southeasterly to Norwalk and Domingues and then to Wilmington where it intercepts a main trunk extending eastward from Torrance through the Long Beach, Seal Beach and Huntington Beach Fields. From the Wilmington refinery a line extends down to the marine loading station which the Union has been working to advantage during the past few years. The Standard Oil Co.'s pipe line system for the transportation of natural gasoline in Los Angeles Basin is exceptionally flexible and permits the movement of gasoline in several directions simultaneously. One main trunk extends southward from Santa Fe Springs to Huntington Beach and is connected up with an east-west trunk running from Norwalk westward to the El Segundo refinery. The latter line is in turn crossed by another running southward from Rosecrans Field to Long Beach passing through Domingues en route. The Texas Company's natural gasoline system consists of a main trunk running from Santa Fe Springs southward to Huntington Beach and another which leaves this line a few miles north of Huntington and extends westward to its Watson refinery passing through the Long Beach Field en route. The General Petroleum's natural gasoline system starts at Richfield extends northward to the Brea Olinda Field thence westward through Santa Fe Springs and terminates at its Vernon refinery near Los Angeles. The Shell has a very comprehensive system for the transportation of natural gasoline in Los Angeles Basin in addition to the Ventura Avenue Wilmington line which has already been mentioned. Starting at Brea Olinda a main trunk extends westward to Santa Fe Springs and then hits off in a southwesterly direction to Long Beach and terminates at the company's Watson refinery, located a few miles northwest of the last-named point. A second main trunk extends southeasterly from Athens to the Watson refinery passing through the Dominguez Field en route.

Map of Systems

The accompanying map shows the relative position of all natural gasoline pipe line systems in Los Angeles Basin. It must be remembered however that this does not indicate the connecting laterals with each field nor show other white lines which are many times utilized in the transportation of natural gasoline from refineries to marine loading stations after it has been blended with straightrun gasoline. One can not but be impressed with the comprehensiveness of the network of natural gasoline lines extending throughout the Los Angeles Basin especially if some thought is given to the economic importance of this method of

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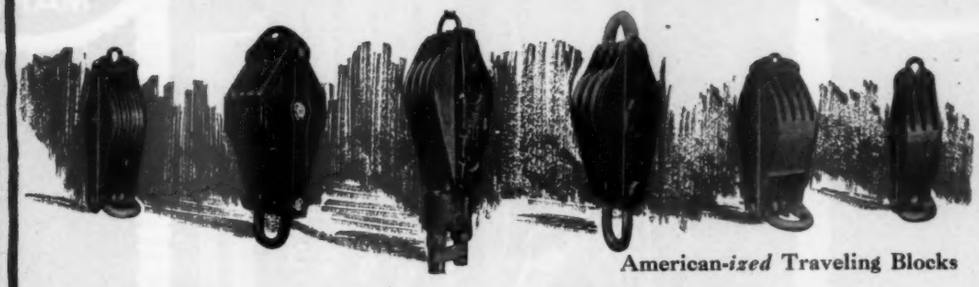

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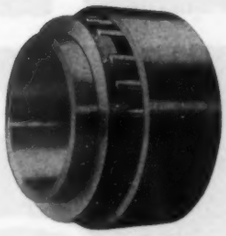

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transportation. Railroad transportation for the large quantity moved yearly would probably be physically impossible if not prohibitive because of high rates and excessive evaporation losses. These natural gasoline lines play a very important part in the distribution of gasoline not only on the Pacific Coast but on the Atlantic Seaboard as well, as The Texas Company, Shell, General Petroleum, Standard and other major California marketers have shipped large quantities of natural gasoline to East Coast ports in the past. The product shipped eastward through the Panama Canal is not wild casinghead but is rather a stable commodity with lower volatility blended with straight run gasoline. The mixture in many instances is approximately 75 per cent of stable natural gasoline and 25 per cent straight run.

Production of natural gasoline in California has shown a consistent increase from month to month during the past several years due to the discovery of new fields, deep zone exploitation in proven areas and increased plant efficiency. During the year of 1925, for instance, operators produced 7,218,574 bbls. of natural gasoline but eclipsed this output by recovering 9,270,627 bbls. in the following year, 1926. In 1927 production of natural gasoline jumped to 11,660,536 bbls. and the recovery exceeded the 12,000,000-bbl. mark in 1928 for the first time in history when a total of 12,984,374 bbls. were produced. For the first six months of the current year natural gasoline plant operators produced 8,852,573 bbls. with indications that the yearly output would run around 20,000,000 bbls. if development work continued unabated. Recently enacted legislation affecting natural gas conservation will probably exert an appreciable effect on future recovery of natural gasoline, however, and it is quite likely that considerably less gas will be treated during the latter part of the current year if the validity of this measure is upheld as a result of impending court action. Kettleman Hills is expected to be taken out of the picture and production reduced in other areas by pending conservation work.

New Gas Law

It is needless to say that the natural gas conservation law will be particularly advntageous to natural gasoline plant operators as its enforcement will guarantee an adequate source of supply for years to come. The natural gasoline industry has had to contend with the same problems affecting refiners and distributors of natural gas due to unregulated production of crude oil. In order to cope with peak production in flush fields operators have found it necessary to erect costly plants only to find them useless a short time later when production fell off and continued declining until it had reached the settled stage. The new gas conservation law will preclude this condition if successful of application and consequently result in more efficient and economical production of crude oil, natural gas and natural gasoline as operators will be able to anticipate plant requirements and thus eliminate any possibility of overbuilding during periods of peak production such as has happened many times in the past. By eliminating excessive flush production the gas conservation law will result in a longer sustained production at a lower operating cost with the result that the total ultimate recovery will be considerably larger than it would under the old method of unregulated production.

The value of natural gas has not been generally appreciated by producers in the field and consequently production activities in the past have not been as efficient as they would have been if the energy of natural gas had been utilized to the highest degree. Excellent work has been accomplished during the past several years with gas lift and repressuring operations, but this constructive work has not yet become statewide in scope. Large quantities of natural gas have been blown into the air in many cases due to a lack of co-ordinated effort, but this economic waste will be prevented if the new gas conservation law is effective. By preventing waste of natural gas, operators will be forced to engage in repressuring work and this will be reflected in a larger ultimate production of natural gasoline as the recycling of dry gas will provide additional quantities of natural gasoline and at the same time stimulate the production of crude oil. In order to comply with the new gas conservation law operators in several fields will be obliged to engage in repressuring work if they wish to participate in flush production. This is especially true at Santa Fe Springs, where deep zone development has been under way for several months and gas waste has been a considerable item. In order to comply with the provisions of the new law which is designed to prevent waste, it has been proposed that surplus gas be injected into the three upper zones. This projected conservation program contemplates the suspension of all production activities in the zones affected. If this suggestion meets with approval the Foix, Bell and Meyer horizons will be repressured indiscriminately. The effect of such an undertaking on the natural gasoline industry is quite evident especially to companies having large plants. A number of progressive operators sponsored a mutual conservation plant for Santa Fe Springs late last year, but a minority prevented its successful consummation. A little better than 85 per cent had signed up for this work but the plan could not be carried through to a successful conclusion without the cooperation of the 15 per cent who held out. The failure of this program was responsible to a large extent for enactment of the new gas conservation law which was passed by the California Legislature at its last session.

The California Natural Gasoline Association has played a very important part in the progress made by the natural gasoline industry in California during the past several years and this organization will become of still more importance as time goes on. It came into being in December, 1925, when a group of operators met for organization purposes at the Shell's assembly hall at Long Beach and elected a representative committee to formulate a set of by-laws and perfect necessary rules and regulations. The association is the outgrowth of a number of informal meetings held by progressive plant operators who had been collaborating for some time on a number of tests and meeting informally about once a week. It has a membership of approximately 700 at the present time. Officers of the California Natural Gasoline Association are G. L. Ratcliffe, president; R. E. Beckley, vice president, and H. W. Parmelee, secretary.

CORROSION IS BIG PIPE LINE PROBLEM

(Continued from Page 35)

as yet, no one material has been found that is universally satisfactory.

The main thing that has been developed in this research work is the fact that impurities in any metal materially shorten the life of the equipment, and for this reason all manufacturers are striving to improve the quality of the pipes and tubes they are making, and this movement is leading to a general upward trend in the length of life of pipe used for various purposes.

If a metal used for any class of equipment subject to corrosion conditions has impurities within the mass the areas of contact between the two elements set up an electrolytic action, especially in the presence of an acid electrolyte.

Soil analysis has shown that there are soils that are much more "acid" than others, and with the varying moisture contents that is common to all soils this acidity will change, and there seems to be some connection between the percentage of impurities in pipe and the acid condition of the soils that directly affects the rate of corrosion.

There seems to be some advantages to

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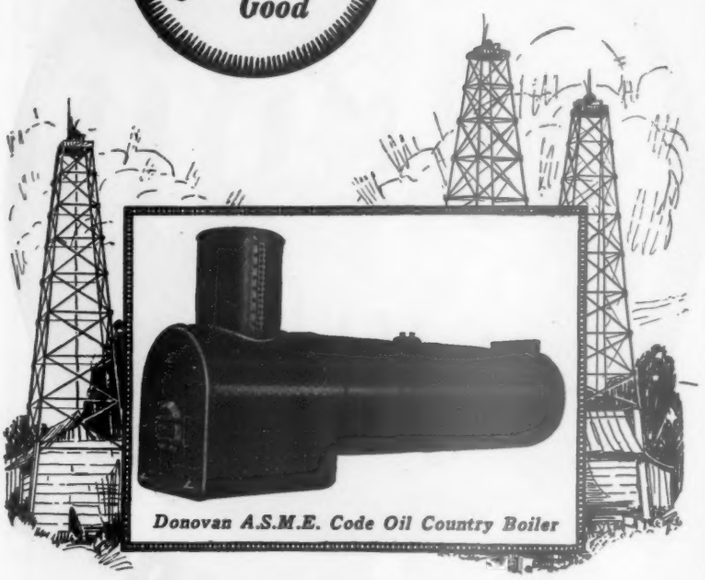

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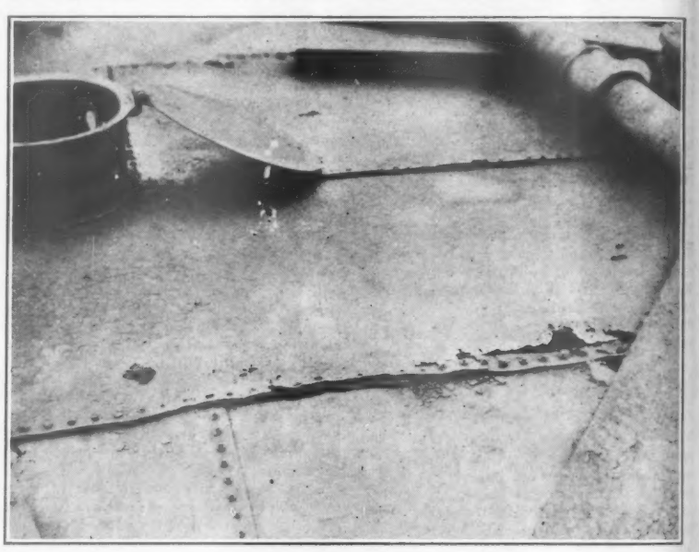
be gained in introducing insulators into pipe lines at points where stray currents are causing electrolysis, or line currents creating a galvanic action, and these insulators usually take the form of gaskets of some insulating material being placed between the ends of the two adjoining joints of pipe, and coating the threads of the pipe and coupling, or covering the outside of the couplings with some insulating material to keep the soil from coming in contact with it. Such methods have had their effect in reducing current flow and in many cases have proved a great aid in preventing excessive corrosion troubles.

It has been noted that where there are leaks at couplings and oil escapes and runs along the line corrosion will be accelerated, and a great deal of discussion has developed as to the causes for such accelerated corrosion.

Effect of Leaks

Speller in his book, "Corrosion: Causes and Prevention" has mentioned some rather interesting cases of protection by oil-films, and further states that he has found a film of oily products in oil steam-heating pipes, and such a film "apparently affords considerable protection."

One the other hand, U. R. Evans, in an article prepared some time ago and published in the A. I. M. E. "Petroleum Development and Technology in 1926" states that he was able to show a small electric current could be produced by immersing in salt water two pieces of steel, exactly similar except that one was slightly greasy and one was free from grease; the greasy electrode was the cathode.



An example of corrosion of tank

This test suggests the possibility of setting up areas of different electric signs along a pipe line and with electric currents flowing along such lines, or electrolysis caused by stray currents being effective, the accelerated corrosion conditions would be created.

Pipe lines traveling areas where salt from oil wells or from other sources has been deposited have shown excessive corrosion in some cases and such type of corrosion may be accounted for largely on the same basis as the excessive corrosion of strings of pipe in wells, which R. Van A. Mills has quite fully covered in Bulletin No. 233, issued by the United States Bureau of Mines entitled "Protection of Oil Field Equipment Against Corrosion."

Where pipes have been buried in soil mixed with cinders excessive corrosion has been noted, probably largely due to the fact that most coal cinders contain an appreciable amount of calcium sulphate, which seems to react with the moisture in the soil to form a weak acid that will readily form combination with the ferric metal in the pipe.

Co-operative Study

For some time past, in fact back as far as the days of the early pipe lines in the Eastern fields, the problem of reducing the effect of corrosion in pipe has been given a great deal of consideration, and in the more recent years there has been a co-ordinated effort put forth by all groups interested, pipe line companies, manufacturers of pipe and makers of protective coatings, to the end that much data have been and are still being gathered on this very vital subject and it is hoped that before long some adequate codes for application and formulas for manufacture of suitable protective coatings will be available.

There are a great number of different types of protective coatings now offered to the trade and all have some merits and are being tried out to some extent and if the results of these tests can be gathered together in some way so that they can be correlated progress will be made in that direction and types of coating will be evolved that will have special merit for protection of pipe under some peculiar type of corrosion condition.

Coatings are generally divided into thin coats and thick coats, and coatings of the plastic type and those that harden to form enamels. Actual field experience seems to indicate that it perhaps will be advisable to use one or more types of coatings on a job, because each form of protector will stand against a particular type of corrosion, and as it has been found that there are places along pipe lines where several factors are entering into the conditions setting up corrosion, this method of protection seems to offer great possibilities.

Wrapping Pipe

After the coatings have been applied the problem still remains to lower the pipe into the ditch and bury it without breaking or abrading the material and to protect this applied coating it has become rather common practice to wrap the pipe with some form of paper covering.

Papers with rag base and others made out of a mixture of asbestos impregnated asphalt known as asbestos felt have been largely used and both seem to have special merits. The rag paper is cheaper in first cost, but it has been found that the asbestos felt has greater tensile strength and can therefore be applied so as to make tighter bond with the pipe and its coating.

There seems to be some tendency for the filler, whether of rag or asbestos fiber to act as a wick and carry moisture by capillary action through the wrapper and permit moisture to accummulate on or in the coating next to the pipe.

As some coatings retain moisture in a small degree this added moisture carried to the coating by this capillary action is objectionable and it has been suggested that some type of coating should be applied over the wrapper after it has been placed on the pipe.

This is still presenting a problem of

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OOC	4	4"	4½"

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lowering the whole piece of pipe with its various layers of coating and painted paper into the ditch without breaking the last coating applied on the paper, and it therefore seems only logical that some means should be developed for impregnating the rag or asbestos fiber so that it will not conduct moisture.

Wrapping Methods

There has been considerable discussion as to the method of applying the wrapper to the pipe, whether the place to make this application is at the pipe mill or in the field.

Several field pipe wrapping machines are now being perfected and hope is entertained that before long it will be possible to wrap pipe efficiently and at low cost in the field as it is being prepared for lowering into the ditch.

However, even if the mechanical problems now presented in designing a suitable machine for field wrapping are overcome there still remains a number of conditions beyond the control of the operator in using such equipment in the field, such as weather conditions, contour of ground that will present problems of locomotion and soil conditions with relation to their texture and ability to retain moisture, in other words, whether they will make mud easily or present a surface for quick drainage.

Pipe that has been bucked up and left out of the ditch unwrapped over night will present a problem in the morning if there has been any precipitation of dew, for usually under such conditions it takes several hours for the sun to shine bright enough to dry off the pipe, and the underside remains moist for some time anyway, so drying this pipe ahead of a wrapping machine is no easy problem to solve.

Soil Maps

A number of the larger pipe line companies are preparing "soil maps" and by correlating soil studies that have been completed in different parts of the country with the relative amount of corrosion noted in each type of soil, they are able to predict with some degree of certainty how a buried pipe will behave in a given type soil.

With this information at hand, and with the methods of making tests of the pipe in the ground well developed by the Bureau of Standards there seems to be many advantages to be gained, and if the test conditions are carried further to include the use of certain types of protective coatings and methods for particular classes of soil, it will be possible in time to work out codes and specifications that should materially assist in reducing the losses to the pipe line companies from corrosion.

There is a movement under way sponsored by the Corrosion Committee of American Petroleum Institute to carry on a set of tests jointly with the manufacturers of the pipe and protective coatings and the pipe line companies, all data to be gathered in a uniform manner under the direction of the Bureau of Standards. Meetings are being held in the various centers of the petroleum industry activity for the purpose of outlining methods of carrying on such tests and it is hoped that at the annual meeting of the A.P.I. to be held in Chicago in December this year a definite program will be decided upon and work started in the field early in the spring of 1930.

VARIED AND UNIQUE USES FOR OLD PIPE

(Continued from Page 35)

combination of a pipe post with the discarded bit set in the top to complete the details, and the whole painted in the color scheme of the camp, is very common.

Where the oil country and the cattle country meet and it is necessary to confine the stock to the range by the use of wire fences, it is the usual practice to close the road by a cattle gauge built out of old pipe, and some ranchers with more imagination than others have added to these guards a finishing touch in the form of a set of gate posts, also of pipe, at the top of which are mounted a sign designating the location of the property, or the name of the ranch, or any other needed information.

This practice of using gate posts of some considerable height dates back to the days when the open range was the rule and not the exception in the West. Two poles of some considerable height were usually set at some point along the road into the ranch property, and served as an excellent guide to the cowboys and ranchers who traveled that way, for it is remarkable at what great distance an object of that kind can be seen on the plains, and if at all distinctive in character they serve as a very satisfactory landmark.

To carry this idea further the oil companies have expanded on it and there are many camps marked by a very elaborate sign worked out in details from old pipe, and then painted so neatly that the whole would do credit to a very high class artist. In such signs the letters are made by cutting, bending and welding the pipe, and not resorting to the use of fittings, which is another method of forming letters out of pipe.

Structures of all kinds are made out of old pipe, and some of these supports are required to carry loads that are very heavy, as well as resist overturning by wind, and as such require a good deal of strength as well as neatness of design.

Buildings for many purposes are made with pipe frames and the roof trusses are as carefully worked out in such structures as they would be if laid out in a well organized structural steel shop. The welder has learned to lay out his pipe jobs with just as much accuracy as the layer-out in the boiler shop or the structural steel department, and as a consequence it is now possible to get very intricate details incorporated into building design.

Poles for telephone and telegraph lines are made out of old pipe, as well as posts for supporting various types of overhead trolley handling systems and for building piers, and these posts and poles are usually set in a concrete block and have a very long life.

Home Yard Accessories

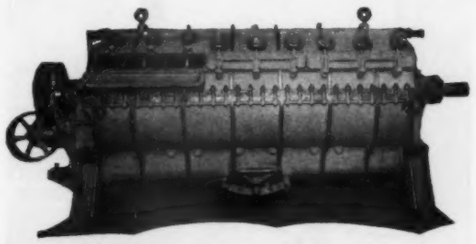
Around the camps in the oil fields it is notable the number of articles for use around the yards at the homes of the workers that have been made out of pipe. Clothes line posts of many and fantastic designs are seen in every camp, as well as low guard rails for flower beds, protecting rails around water and gas pipe line gates, fence posts and other things too numerous to mention, but all serving some particular purpose and helping to utilize old pipe that has served its day for its original purpose.

When the industry was young and lumber was plentiful, it was the usual practice to build many things of wood that are now being made out of old pipe, for the welder of today has taken the place of the carpenter of yesterday, and old pipe and tubing has been substituted for lumber and logs, and with the new order of things the oil field worker is building for permanency as well as serviceableness, and his efforts are quite noticeable in any oil field or camp.

Even the children of the camps come in for their share of old pipe novelties, for nearly every school yard has swing supports made out of old pipe, and several ingenious types of merry-go-rounds, teeter-totters, slides and some more modern health exercising devices are fashioned out of material discarded and normally considered as junk. Basketball ringback board supports are made out of old pipe, as well as the goal posts for the football fields.

In the field offices it will be noted that railings are made out of old pipe and tubing, with the gates and braces carefully thought out and every detail well executed. Typewriter stands are built out of old pipe, and sometimes the frames for racks for office supplies are built out of the same material.

Map frames so designed that as many maps as are needed can be hung on them and easily examined, are seen not only in the field, but sometimes in the main offices of production and transportation companies, and the general idea is even carried so far that some of these map frames are made portable, that is, in such a manner that they can be knocked down for shipment where it is



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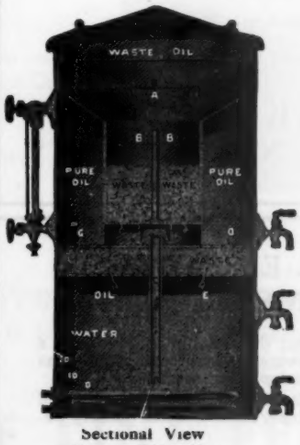

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The Oil and Gas Journal

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necessary for the engineer or department head to move from place to place and carry his charts and maps with him to be used during his talks at field meetings.

Pipe Troughs

Pipe split in half by the use of the acetylene torch, then closed at the ends to form a trough, are used to hold the oil or lubricator with which wire lines are covered. Split pipe have also been used in the Panhandle area as covering for the lead lines from well to tanks where it was necessary to keep these lines heated or radiation of heat from the steam lines that paralleled the oil line would be too great.

In one case in the Panhandle it was necessary to carry water and b.s. from the treating tanks to a pond at some distance from the tank battery, and the contour of the ground was such that the ditch could not be dug in the soil so 8¼-inch casing was split lengthwise and welded together to form a very good trough, and this trough was supported across the dry arroyo by pipe posts, and at one point it became necessary to form a siphon to carry the fluid across a roadway, and this was done with old pipe welded into the shape of a "U," with one arm longer than the other.

One of the original uses for old pipe was making pumping derricks, and at Keifer the Prairie Oil & Gas Co. has maintained a derrick shop for 15 years, using up old pipe that has been reclaimed from its various fields and shipped to Keifer for test and rethreading if suited for further use as pipe.

In the Drumright Field old casing is used to form pulling shear poles and left permanently over the well, and this method of handling rods and tubing has proved very satisfactory, for it permits the wells to be serviced in much shorter time than they could be if it was necessary to set up pulling machines each time this work had to be done.

Another use for old casing in the Drumright Pool is the manufacture of a type of pumping jack that can be mounted upon a concrete pier in such a manner that the well can be pumped with the walking beam, and the power secured from a central power and transmitted through the usual type of pull rods.

Pump Jacks

In addition to the pump jacks made out of old casing, these wells were also equipped with a device for handling rods in the event of their parting, that was made out of a piece of 8¼-inch casing so mounted that a short service line could be wound over it when towed with chain tongs, and by this arrangement much time could be saved in getting a well pumping in the case of rod breaks.

Samson and jack posts for both drilling and pumping conditions are made out of old casing. The top of the casing used for the samson post is capped to receive the side irons and saddle of the walking beam, while the jack posts have plates suitably cut to accommodate the jack post boxes.

Walking beams and pitmans are also made out of casing, and in many cases this is old material discarded at the lease, although a manufacturer is making a line of pipe walking beams and pitmans out of new pipe.

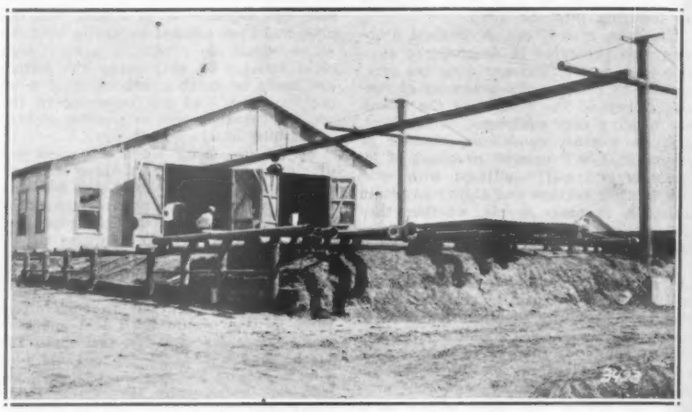
Guides for the counterweights used on pumping wells are made out of old pipe, as well as a number of other pieces of equipment used around both drilling and pumping wells.

Retaining Wall

At one place along the creek in the Drumright district a complete retaining wall has been made along the bank, using only old pipe which is formed into a mat that saves the creek walls from cutting by water of the stream.

It would seem that this recital of uses for old pipe, tubing and casing might be continued almost indefinitely for the number of things made out of this old material seems limited only by the number of uses that arise in the fields for such articles, and the ingenuity of the welders, and it would be interesting to find out how much material is salvaged each year from the total output of tubular goods sent to the oil fields for such purposes.

And, as a matter of fact, the use of old pipe for other articles is by no means limited to the oil industry, for this material seems to have a certain appeal to men to cause them to work with and shape and form new articles out of old pipe, and so it is noted that the use of old pipe in all industries is quite extensive.



Pipe shop and rack made from used pipe.

SUN BUYS PART OF LINE

HOUSTON, Tex., Aug. 26.—The Sun Pipe Line Co. has purchased from the Liberty Pipe Line Co. the Barbers Hill-Liberty section of the latter company's line from Liberty to Cedar Bayou, several miles to the south of Barbers Hill. The part purchased has been unused for several years, but will be reconditioned and tied into the Sun's line from Liberty to Sabine Pass and will run Sun Oil Co.'s Barbers Hill production. The southern portion of the line from Barbers Hill to Cedar Bayou is retained by the Liberty Pipe Line Co. and will continue to run the production of Mills Bennett Production Co. and crude purchased from other operators.

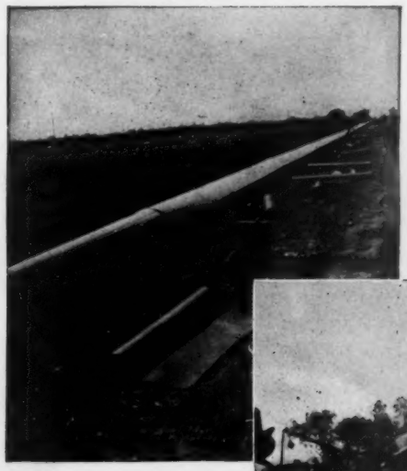
GOLF TOURNAMENT PROMISED

HOUSTON, Tex., Aug. 26.—Preliminary arrangements for the entertainment of those attending the Texas-Louisiana-Arkansas district meeting of the American Petroleum Institute in Galveston, September 5 and 6 have been started by the Houston Wildcat committee. E. R. Ames and W. L. Childs have been placed in charge of the entertainment arrangements. They say that a golf tournament and water sports will be provided.

PLANT ENLARGEMENT PLANNED

BEAUMONT, Tex., Aug. 26.—The Beaumont Iron Works is planning enlargement and improvement of its plant here. Details have not been announced but the company will spend between $50,000 and $70,000. The Beaumont Iron Works deals largely in oil field equipment.

Guarding GAS LINES against underground foes



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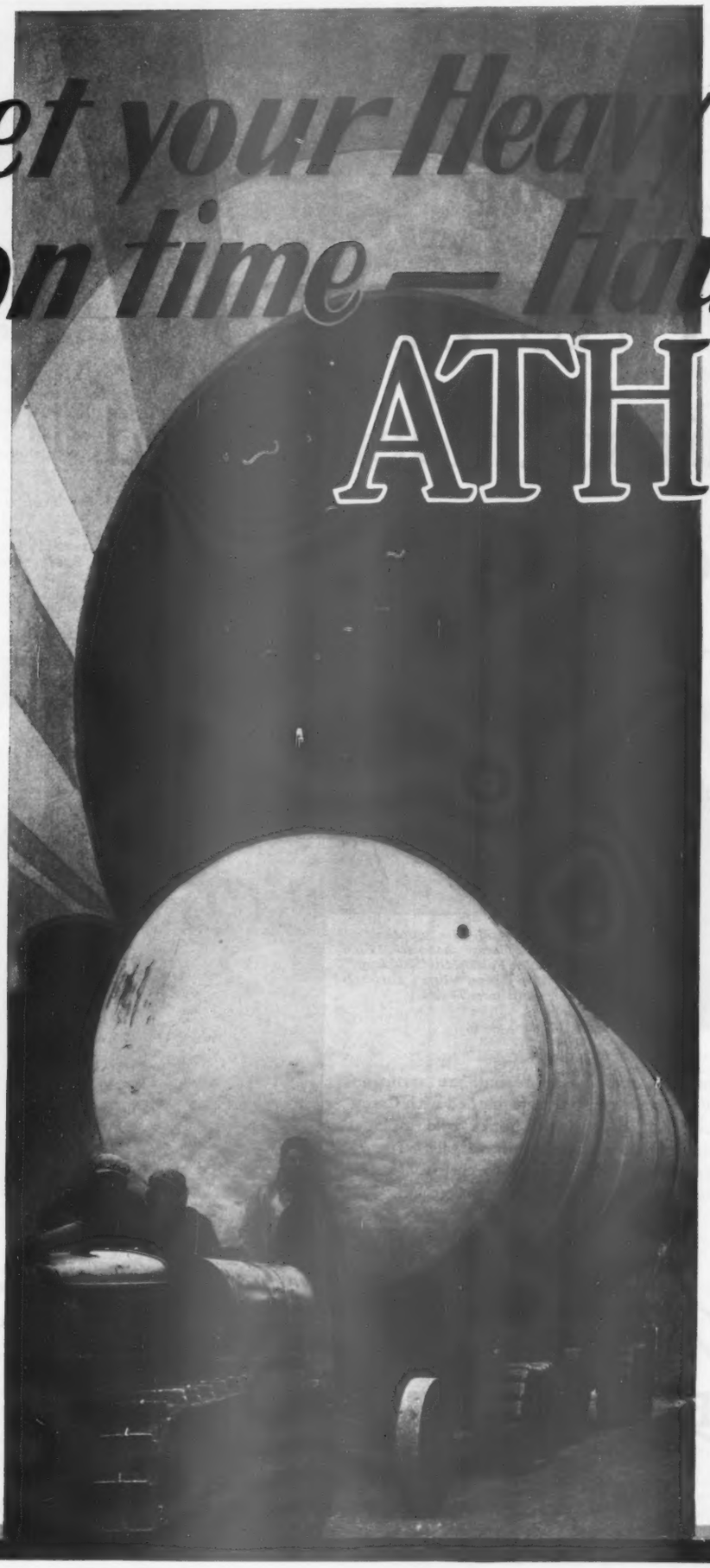

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DISCHARGE CAPACITY OF RELIEF VALVES

(Continued from Page 42)

specific heats usually vary with temperature, their difference remains practically constant.

$k = \frac{c_p}{c_v} = \frac{mc_p}{mc_v}$ where m = molecular weight for any gas:

$mc_p - mc_v = 1.985$, or approximately 2. [7]

Then,

$$k = \frac{mc_v + 2}{mc_v} = 1 + \frac{2}{mc_v} \qquad [8]$$

Thus k approaches unity as $\frac{2}{mc_v}$ decreases.

While there is no simple relation between c_v and m, the product mc_v will generally increase with increase of m.

Magnification of the graph of k against $\phi(k)$ where k is close to unity reveals the fact that approximately linear decrease of $\phi(k)$ with decrease of k continues until k reaches a value of about 1.001, after which the decrease becomes very rapid. If it can be shown, then, that k will never become less than 1.001 for oil vapors, the corresponding value of $\phi(k)$, or 0.429, can be inserted in the ideal gas equation, and $\phi(k)$ removed as a variable factor. To make $k = 1.001$ (that is, $\frac{2}{mc_v} = 0.001$) then mc_v would have to equal 2,000 (by equation [8]). To make mc_v equal 2,000, a charge having m=500 would have to have $c_v = 4$. Both of these values are certainly too high; in actual work m=200 and $c_v = 1$ are probably near the true values, whence $mc_v = 200$, $\frac{2}{mc_v} = 0.01$, k=1.01. A relatively large change in the assigned value of mc_v (within the zone of probable values) is seen to result in a relatively small change in the value of $\phi(k)$. Furthermore, k=1.001 is a safe minimum unless mc_v has a value greater than ten times its probable value. Therefore $\phi(k)$ can be safely taken as 0.429 in the ideal gas equation.

Probable value of $mc_v = 200$
$k = 1.01$, $\phi(k) = 0.430$
for value of $mc_v = 2{,}000$
$k = 1.001$, $\phi(k) = 0.429$[4]

[4]Note that if the actual value of mc_v were less than 200, the value of $\phi(k)$, and hence the actual capacity of the safety valve, would be greater than the calculated value—an additional deviation in the direction of safety.

Safety Discharge Capacity

Safety valve discharge capacity is usually calculated in pounds per hour. Starting with equations [4] and [6], and the constant for $\phi(k)$ fixed above, a general equation for safety valve capacity is derived as follows:

Equation [4] $w = ap_1\sqrt{\frac{2g}{RT_1}} \times \phi(k)$ .....lbs. per sec.

Equation [6] $R = \frac{1544}{MW}$

$W = w \times 3{,}600 \times$ (coefficient of discharge).....lbs. per hour
Coefficient of discharge = 0.97 for "full bore" valves.

$$W = 3{,}600 \times 0.97 \times ap_1\sqrt{\frac{2g \times MW}{1544\,T_1}} \times 0.429$$

$$W = 306\,a\,\sqrt{MW} \times \frac{p_1}{\sqrt{T_1}} \qquad [9]$$

W=discharge capacity of valve (pounds of oil vapor per hour).

a=discharge area of valve (square inches).[5]

[5]To prevent reduction in capacity due to losses in the inlet connections, this area is less than the cross sectional area of a pipe of the same nominal size as the valve. For standard valves made by the Crosby Steam Gage & Valve Co. this area is as follows:

Valve size	Throat area
1½ inches	0.785 square inch
2½ inches	1.77 square inches
3 inches	2.76 square inches

The valves listed above are suitable for pressures up to about 800 pounds; for higher pressures, valves with smaller throats are used.

p_1=absolute pressure of vapor under valve (pounds per square inch).

MW=molecular weight of vapor passing valve.[6]

[6]In deciding upon the molecular weights to be used in evaluating this equation the following data may be useful:

DATA ON STOCKS FROM CRACKING TEXAS CRUDES

Stock—	Grav.	Init.	50%	EP	MW
Pressure distillate	51.8	90°	296°	432°	151
		% at	500°		
Recycle gas oil	26.8	346	84%	....	180
Primary reaction chamber	19.4	178	35	....	202
Feed from accumulator	18.8	384	32	....	221
		Flash	Visc.		
Reduced crude	27.4	R.T.	286/100	....	239
Fuel oil residue-less than 10	above 70	....	....		356

These molecular weights were determined cryoscopically in benzol. The calculated molecular weight of the vapors leaving the primary reaction chamber, including fixed gases, was 189.

T_1=Absolute temperature of vapor under valve (degrees Fahrenheit).

Appendix

Comparison of actual flow of steam with flow calculated by perfect gas equation:

The use of a formula based on the equation of flow of an ideal gas has been advocated in the body of the article as a safe method of calculating the flow of oil vapors, whose exact composition and physical properties have not in general been definitely established. Steam is a vapor whose composition is fixed and whose physical properties have been thoroughly investigated. The flow of steam through orifices has been the subject of innumerable tests and is well understood. An interesting comparison can therefore be made between the known flow of steam and the flow as calculated from the equation for an ideal gas.

Actual flow of steam: The actual weight of steam which will flow through an orifice (when the back pressure is low) may easily be calculated from the steam tables and Mollier diagram. Starting with any given initial pressure, and with dry saturated or superheated steam, assume various values for the throat pressure in the vicinity of six-tenths of the initial pressure. Read from the Mollier diagram the isentropic heat drop from the initial condition to an assumed throat pressure, and the moisture content (or superheat temperature) at the throat condition. Then the weight which would flow through a 1 square inch orifice, if the assumed pressure existed at the throat is:

$$w = \frac{V}{144v'} \qquad [10]$$

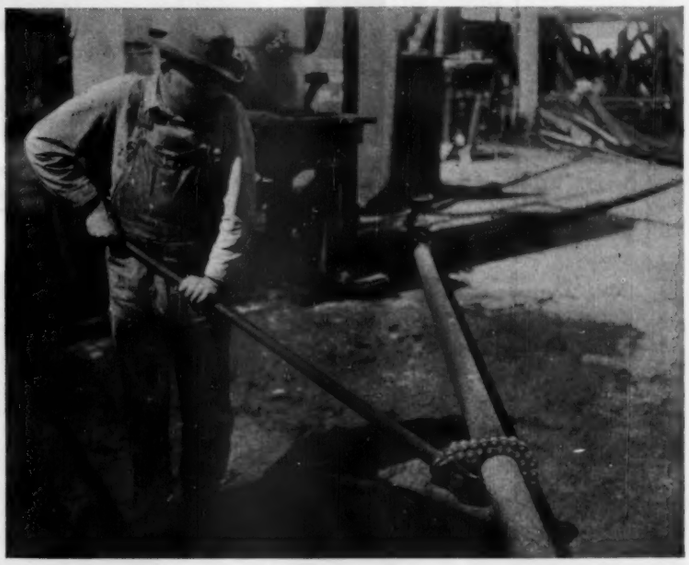
where:

w=flow in pounds per second.

V=speed in ft. per sec. $223.7\sqrt{\text{Heat drop}}$

v'=specific volume in cubic feet per pound at assumed throat pressure corrected for quality (or temperature) at throat resulting from isentropic expansion.

The assumed value of throat pressure which results in the maximum w (by



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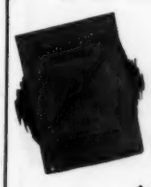

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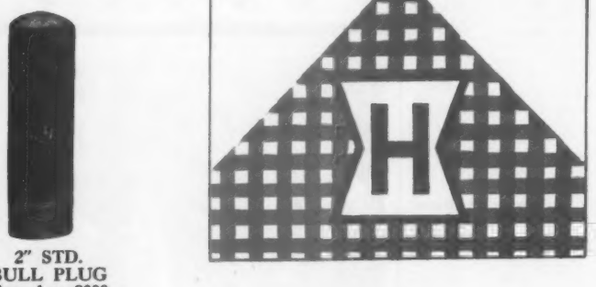

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equation [10], is the critical pressure, and the corresponding maximum w is the weight which will actually flow.

For saturated steam the maximum weights of flow, calculated by the above method for various initial pressures, if plotted against their corresponding initial pressures, will be found to agree very closely with the straight line equation:

$$w = \frac{p_1}{70} \qquad [11]$$

(Napier's Rule $w = \frac{ap_1}{70}$, when a=1.)

Equation [11] has been proven by many tests to satisfactorily represent the flow of saturated steam, and is generally accepted. It has been used in calculating actual flows of saturated steam in the comparative table.

For superheated steam there is no well recognized equation like [11] for saturated steam, and the general method of calculation has been used for the values in the table.

Flow of steam calculated by the ideal gas equation: To make the calculations by the ideal gas equation comparable to the actual flow figures, equations [4] and [6] are combined as follows:

Equation [4] $w = ap_1\sqrt{\frac{2g}{RT_1}} \times \phi(k)$

Equation [6] $R = \frac{1544}{MW}$

Then,

$$w = ap_1\sqrt{\frac{2g\,MW}{1544\,T_1}} \times \phi(k)$$

For steam:

$MW = 18$

$(H_2 = 2 \times 1 = 2)$

$(O = 16)$

$(MW = 18)$

For dry saturated steam:

$k = 1.135.$[1]

$\phi(k) = 0.449$ (from graph)

For superheated steam:

$k = 1.300.$[1]

$\phi(k) = 0.472$ (from graph)

[1]Stodola, Steam and Gas Turbines, authorized translation from the sixth German edition, New York, 1927, p. 47.

T_1=absolute temperature of saturation

$$w = 0.389\,a\frac{p_1}{\sqrt{T_1}}$$

T_1=absolute superheat temperature

$$w = 0.409\,a\frac{p_1}{\sqrt{T_1}}$$

KENTUCKY-TENNESSEE

(Continued from Page 72)

will bring about a rush of the drill to the newly-found formation.

Eastern Kentucky Wells

A few completions are reported from the eastern part of Kentucky, where work has been slow for many months, although there is an abundance of drillable territory in many of the counties in that part of the State.

In the Weir sand area of Johnson-Magoffin Counties, District 27, the Marbold Development Co.'s Nos. 5 and 6 on the Nancy Vanderpool, are rated at 10 and 15 bbls., respectively. Hupp & Duff's No. 4 on the Riggs Bailey, District 31, is a 10-bbl. pumper. In District 29 the Pittsburgh Trust Co.'s No. 7 D. M. Wheeler pumped 4 bbls. from the Weir sand.

A purely wildcat well was drilled by J. T. Justice and others on the Turner farm between Hazard and Walkerton in Perry County, far away from known production and the well is reported to be a large producer of gas which can be utilized to good advantage in that part of the State.

In Lee-Owsley Counties, District 17, the First National Bank of Jackson, trustee, drilled in No. 3 on the Darch & Short heirs lease, getting a 5-bbl. pumper. Superior Oil Co.'s No. 3 on the Calmes & Park land produced 3 bbls. and No. 4 is about due for completion. Same company's Nos. 1 and 2 on the Elijah Sparks, same district, produced 3 and 1 bbls., while in District 18, J. D. Welch's No. 4 on the W. C. Burgin produced but 1 bbl.

In Lawrence-Johnson Counties, also in the Weir sand development, the Swiss Oil Corp.'s test on the Sena Saggs, District 32, pumped 4 bbls.

In Estill County, Irvine Field, the Gate City Oil Co.'s No. 8 on the John and Patsy Marcum land, produced 1 bbl. initial.

In the Monticello Field of Wayne County, District 5, Porter Abbott and others' No. 18 on the Coffey-Oatts lease, pumped 2 bbls. In District 13, M. D. Shearer's No. 6 on the Coyle heirs, pumped 3 bbls. Four new wells are under way in this same district by George A. Hook's No. 13 William Betram; William C. Southern, Jr.'s, No. 10 Nancy Jones and others' lease; March Brothers' No. 1 Sam Raines and J. T. Frank's No. 1 on the Arch Morgan.

Garrison Brothers are about due to bring in their No. 4 on the James B. Roberts, District 9, Wolfe County.

Week's Work

A summary of the week's work in the Kentucky Field shows 31 completions, 26 producers with an initial of 744 bbls., 4 dry holes and 1 gas well.

County—	Comp.	Oil wells	Prod.	Dry	Gas
Ohio	10	10	517	0	0
Daviess	4	1	100	3	0
Lee-Owsley	5	5	13	0	0
Johnson-Magoffin	4	4	39	0	0
Henderson	2	2	65	0	0
Wayne	2	2	5	0	0
Warren	2	1	1	1	0
Lawrence-Johnson	1	1	4	0	0
Perry	1	0	0	0	1
Total	31	26	744	4	1

Ohio County Wells

The Bartlett Pool, southwest of Taffy, in the northern part of Ohio County, lists the two best wells found in the Tri-County Field, since the last review. They are Hupp & Duff's Nos. 17 and 18 on the L. Trodgen lease, which adjoins the Ellis Bartlett lease where the discovery well was drilled. These two wells showed initial production of 150 and 200 bbls.

Chester Oil Co.'s No. 4 on the M. E. Medcalf farm in the Deanfield area, produced an initial of 60 bbls. from a total depth of 405 feet.

D. T. Bolling and others drilled in a 40-bbl. initial producer in No. 3 on the V. Westerfall 37 acres, in the Whittaker Pool.

The Ohio Oil Co.'s test on the J. T. Helm in the Whittaker Pool, is a light pumper, only showing 2 bbls. initial.

In the Friendship Church area east of the Ambrose-Weller Pool, the Sirmans Co.'s No. 17 well on the Nancy Farmer farm is rated as good for 30 bbls. initial.

Meredith and others' No. 3 on the S. F. Whitley 48 acres developed into an 8-bbl. pumper.

James C. Ellis and others' No. 2 on the A. B. Ralph is reported as good for 8 bbls. at a total depth of 460 feet. A string of 440 feet of casing was set in this hole and the sand at from 448 to 460 feet, and shot with 60 quarts.

Wood Oil Co., Inc.'s No. 5 on the Nannie Rogers 151 acres pumped 5 bbls. initial.

John Breen and others' second test on the E. E. Fuqua in the Deanfield Pool, produced an initial of 14 bbls. at a total depth of 430 feet. A string of 410 feet of casing was put in the hole and the sand found from 415 to 427 feet, and shot with 80 quarts.

Daviess County Wells

The Cumberland Petroleum Co.'s No. 4 on the Widow Salmon farm in the Salmon Pool in Daviess County, is reported

"IWANA" Hair Belting

"Favorite of the Oil Fields" and UNRIVALLED for SERVICE

Will outwear and stand more hard use and abuse than any other make of BELTING.

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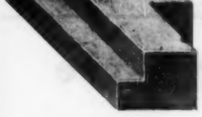

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WRITE
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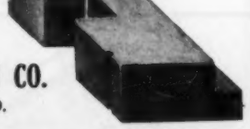
KANSAS CITY, MO.



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REECE sturdy, comfortable footwear will eliminate slipping, keep the feet dry and comfortable, and will outlast many pairs of ordinary shoes. *Built especially for refiner service.*

Made of No. 1 oil grain leather, full gusset, guaranteed counters and heavy felt insole. Lockstitched with heavy wax thread. Every pair is water proof and the wooden sole is non-conductive to heat or cold.

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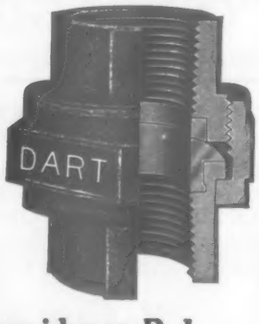

E. M. Dart Mfg. Co., Providence, R. I.
The Fairbanks Co.,—Distributors

showing around 100 bbls. Same company's No. 3 on the Hayden heirs in the Burton Pool is reported a duster.

The Red Bank Oil & Gas Co.'s important test on the St. Joseph Academy 750 acres, west of West Louisville and in the western part of the county, has been given up as a dry hole.

The Petroleum Co. also got a duster in a test on the Lewis Burns lease in the Utica Field and just west of the big production on the E. Burns farm.

The wildcat well that was drilled by Dahlgren & McMahan on the Jennie Wilson 1,300-acre lease known as the Bon Harbor Hills farm that came in without oil or gas production is a setback for that part of the county.

Scattered Completions

In the Bowling Green Field of Warren County and southwest of the town, the Allen Oil & Gas Co.'s No. 4 A. C. Bettersworth 50 acres, produced but 1 bbl. initial at 490 feet. In the same area Melvin Tabor's second test 80 feet from the north line and 640 feet from the east line of the B. A. Davis farm, is a dry hole.

In Henderson County, Niagara Field, H. Clark's No. 1 on the J. C. Duncan farm, estimated at 30 bbls. initial and Turner & Lewis' No. 1 Walker Thornberry is reported as good for 35 bbls. initial at 731 feet.

CENTRAL WEST FIELDS

(Continued from Page 72)

658 to 660 feet. Preston Oil Co.'s No. 2-955 on the Robert Crew, Section 23, produced 3 bbls. in the upper Berea sand from 1,794½ to 1,811½ feet, total depth 1,817½ feet. Southern Ohio Petroleum Co.'s No. 1 R. B. Sellers, Section 36, produced an initial of 6 bbls., from the upper Berea at 1,843 to 1,864 feet. Tyree and others' No. 3 on the J. W. Camden, Section 11, is rated as good for 5 bbls. initial. Their No. 4 on the Mary Jividen, Section 24, shows for a 1-bbl. pumper in the Cow Run sand at 545 to 560 feet, but it is going deeper in hope of finding something more prolific in the Berea sand. The same firm's No. 5, same farm, is reported at 6 bbls. from the upper Berea sand at 1,664½ to 1,682½ feet, total depth 1,685½ feet.

In Jackson County, Coal Township, the Ohio Fuel Gas Co. failed to find anything worth while in No. 1-3559 on the W. H. Talbot, Section 36, in the Clinton from 2,593½ to 2,605½ feet, total depth 2,649 feet. It will be plugged and filled back to the Berea sand where a showing was found.

In Fairfield County, Rush Creek Township, the No. 4 of the Hope Construction & Refining Co.'s Sam W. Black, Section 13, does not look encouraging. Water was found at 5,092 to 5,095 feet and filled up 2,500 feet with brine.

In Delaware County, Oxford Township, the Lee Oil & Gas Co. is drilling a purely wildcat test on the H. J. Dennis farm.

In Morgan County, Marion Township, the Kemrow Co. has a light gas well in No. 3 on the Lewis T. Hoffman, Section 30, in the lower Berea sand at 1,598 to 1,617 feet, total depth 1,618 feet.

ILLINOIS

Activity prevails in the Dupo Field, in Sugar Loaf Township, St. Clair County. This is to a large extent a town-lot development and while the wells come in good at shallow depths, it is evident that the Trenton Rock, the sand in which the oil is found, will become drained rapidly, as wells are being drilled on almost every spot that has room for a derrick. The work is not all confined to small lots, as some acreage surrounds the town and the life of wells there will be longer. Few dry holes are found and the initial production is above the average. The oil is found at 400 to 700 feet and only a few days are required to find out what is down there. The smallest of the late completions were two 7-bbl. wells and the largest of the late wells produced an initial of 160 bbls.

Ohio Oil Co.'s No. 1 J. A. Reichert, SW quarter Section 27, produced an initial of 50 bbls. at 641 to 695 feet; same company's No. 7 Matilda Dyroff, NW quarter Section 28, produced 150 bbls. initial at 495 to 571 feet. This company's No. 2 Hull & Weihl, NE quarter Section 28, produced 160 bbls. at 441 to 528 feet.

Roddy & Logan's No. 1 Wm. Bruer lot, SE quarter Section 21, produced 7 bbls. at 562 to 570 feet.

L. G. Blackman and others No. 1 Fred Kelley lot, SE quarter Section 21, produced 80 bbls. initial at 495 to 550 feet. Their No. 1 C. P. Phillips lot, same quarter section, 40 bbls. at from 497 to 553 feet. Same parties' No. 1 S. J. Paul lot, SE quarter, Section 21, produced 90 bbls. initial at from 501 to 543 feet. Clyde Sparks' No. 1 Anna Nolte lot, SE quarter Section 21, 80 bbls. at from 507 to 549 feet. Sparks & Poulton No. 1 A. D. Harlow lot, SE¼ Section 21, 10 bbls. from 531 to 570 feet. Thomas Whelan's No. 1 Arthur Briggs lot, SE quarter Section 21, 25 bbls. at from 498 to 564 feet; same No. 1 B. J. Mellon lot, same section, 25 bbls. at from 506 to 553 feet; same No. 1 Whiteside lot, SE ¼ Section 21, 70 bbls. at from 493 to 552 feet; same No. 1 John Barker lot, SE quarter Section 21, 12 bbls. at from 501 to 548 feet; same No. 1 Lena Hrbst lot, SE quarter Section 21, 65 bbls. at from 484 to 547 feet. Same No. 1 F. and M. Nieman, SE quarter Section 21, 20 bbls. at from 491 to 553 feet.

Landwehr & Sacks' No. 6 E.St.L.&C. W.R.R. right of way, NE quarter Section 28, started at 100 bbls. at from 487 to 556 feet. Same, No. 7, same right of way, 40 bbls. at from 496 to 543 feet. H. & M. Operating Co., No. 1 F. & H. Weisenborn lot, NE quarter Section 21, 7 bbls. at from 495 to 540 feet. Same, No. 1 J. F. Ottis lot, SE quarter Section 21, produced 25 bbls. at from 497 to 535 feet. Majestic Oil Co. No. 1 Luther Smith, SE quarter Section 21, had an initial of 40 bbls. at from 481 to 547 feet. Karns & Shafer, No. 1 H. J. Bruer lot, SE quarter Section 21, produced 15 bbls. at from 530 to 575 geet. James K. McKeak No. 1 W. H. Lindemann lot, SE quarter Section 21, showed 125 bbls. initial at from 515 to 550 feet. Sidie & Bohannon No. 1 Dickey-Mousette lots, SE quarter Section 21, initial production 40 bbls. at from 494 to 530 feet. Same No. 1 Dr. Cooper lot, NE quarter Section 28, initial production 25 bbls. from 515 to 560 feet.

Bingham & Abbott No. 1 Charles LaCroix lot, SE quarter Section 21, 50 bbls. initial at from 498 to 545 feet. St. Clair County Oil Co. No. 1 Hall & Weihl lot, NE quarter Section 28, 35 bbls. initial from 488 to 542 feet. James C. Ellis & Co. No. 1 Charles Welch lot, SE quarter Section 21, produced 40 bbls. initial at from 495 to 558 feet. Murray & Ellis No. 1 Charles Drake lot, SE quarter Section 21, with initial of 20 bbls. at from 494 to 556 feet. McRone and others No. 1 Less Pullen, SE quarter Section 21, produced 25 bbls. initial from 495 to 544 feet.

LOUISIANA CORP. ENTERS "ONE-STOP" STATIONS

(Continued from Page 366)

er is able to put this money in sizes for which there is a steady demand and yet need stand no loss from not stocking the other sizes.

The supremacy of the automobile as a transportation agency has made the automobile service business a field of keenest competition with the result that the auto supply "department store" is an outstanding solution to the problem of adequate profits, especially since this same condition has brought about a comparatively narrow margin of profit on most individual automobile supply items. Tires, "gas," oil and grease are the four items most constantly in the owner's mind; combine the four and possibly light globes and batteries in one distributing and service system and the overhead is reduced.

The Louisiana corporation decided to go into the tire business as a starter, and is now arranging to add batteries

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SUCKER ROD RACK

Keeps your rods safe and out of the way

One of the most efficient devices for conservation of rods, time and money. Speed, safety, economy — all are assured if you use the Lorraine Sucker Rod Rack. With the aid of the special hanger the stand of rods is shoved into its proper place in the rack at the derrickman's convenience. Meantime, the elevator goes down for another stand. The cost of the Lorraine rack is soon paid for in time saved and protection to the rods.

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IRON BODY BRONZE MOUNTED OR ALL IRON VALVES
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CAST STEEL VALVES
for
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Powell Valves are particularly adapted for handling volatile and hazardous liquids and gases.

Fig. 1431
Iron Body Gate Valve

Fig. 2003
Cast Steel Gate Valve

Fig. 1444
Iron Body Gate Valve

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Booths Nos. 41 and 42
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BECAUSE of the added strength of nickel cast iron and special alloy cast steel, Powell Valves will better withstand strains and distortions of pipe line service.

All Powell Valves are built with safety factors far greater than for the intended service.

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Valves of Bronze, Iron and Steel in Globe, Angle, Cross, Check, Gate and Safety patterns. Also Oilers, Lubricators, Grease Cups, Water and Oil Gauges, Whistles, Whistle Valves, etc.

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and bulbs. Anticipating, from results of its investigation into the volume of business in tires done by its agents and dealers who had been handling them as a side line, a business approximating a minimum of $2,000,000 per year, the next step was to select the merchandise to be handled and the connections to be utilized. Several sources of supply were considered; handling some nationally advertised brand; handling the selected line on a jobbing basis and the manufacture for it by one of these nationally known makers of a tire built to the company's own specifications and marked with its own name and trade mark.

The last of these was finally decided upon after it was found that those manufacturers whose goods seemed the most desirable had no jobbing organization, and the first alternative offered little, if any, advantage. It insures complete control of a definite source of supply. The jobbing line, furthermore, was discarded with the decision that the tire should be a quality product, of materials and workmanship comparable to the so-called standard makes marketed today. The demoralized condition of the standard tire market traceable to systematized price cutting made the first suggested connection unsatisfactory.

Having decided upon marketing a tire manufactured for it under its own trade name and according to specifications worked out by an experienced tire expert chosen from the staff of one of the large nationally known companies, the Louisiana corporation negotiated with another large manufacturer and has contracted for an initial 200,000 tires per year. Its warehouses throughout the territory, which embraces East Texas, Louisiana, Mississippi and part of Arkansas were stocked and a full assortment of tires placed in each of the company's own stations and those operated by independent dealers handling other Louisiana products.

A thorough advertising campaign with billboards, newspapers, spare tire covers and posters as the mediums, appeared simultaneously throughout the territory and on a designated date the new tire was displayed and the sales campaign launched. Results thus far have been entirely satisfactory to dealer and company alike and before long the company's line of batteries will be added as another detail of the "one-stop service station" policy.

At the outset the company has simplified its tire business by limiting the tires and tubes it handles to 13 sizes for passenger cars and light commercial vehicles, these being furnished in both regular and heavy duty construction. Four other sizes will be available to dealers who have truck customers though they will not necessarily have to carry them in stock. This limiting of the line to 13 sizes will be appreciated by the experienced tire dealers for investigations have shown that there are 13 sizes that make the most money for the retailer.

Service Organization

To back up the merchandising of its tires the company also has set up a service organization in urban districts. In these communities a central repair department is maintained. In case a customer comes into a Louisiana station with a flat, or gets a blowout near the station the attendant phones the repair shop and while his car is being serviced his tire is being repaired. The "one-stop service station" idea carried out to a fine point.

LEGAL

TRIBAL OSAGE OIL LEASES AT PUBLIC AUCTION SEPTEMBER 20, 1929, BY UNITED STATES GOVERNMENT.

At Pawhuska, Oklahoma, about 20,000 acres will be offered for oil leases in quarter section tracts. Bids will be for bonus in addition to royalties, 25% payable on day of sale, balance in three annual installments, with acceptable security. Within advertised area there are about 9,850 wells producing from one barrel to 100 barrels each, the total daily production for June, 1929, being about 42,000 barrels; also, there are about 30 wells drilling. All lands are now leased separately for gas. Blue print maps of area advertised, showing tracts producing oil or gas, can be had for fifty cents each, also logs of producing oil or gas wells for twenty-five cents each well. Write U. S. Superintendent, Osage Agency, Pawhuska, Oklahoma, for maps, logs or other information.

The opportunity, the man or whatever you need pertaining to the Petroleum Industry is very apt to be found in our Classified Wants Section. Everyone benefits by reading these pages. Don't miss looking over them. Pages 344 and 345.
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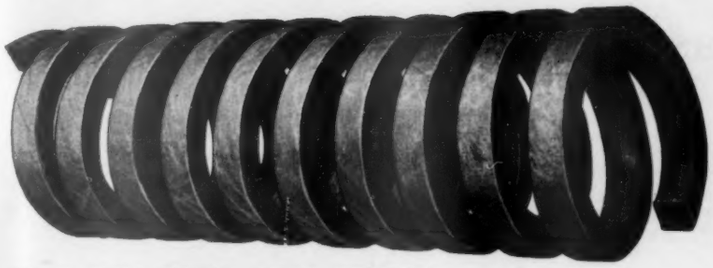

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You'll get a big kick out of the way D-10 keeps right on sealing and serving long after other kinds have given out.

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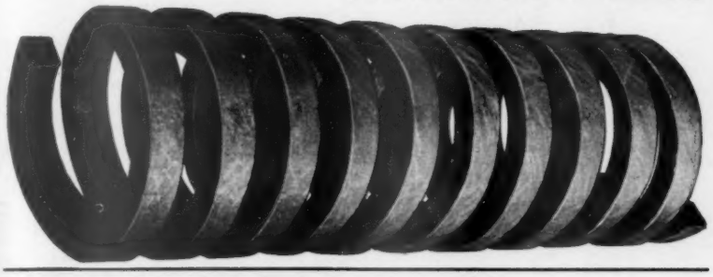

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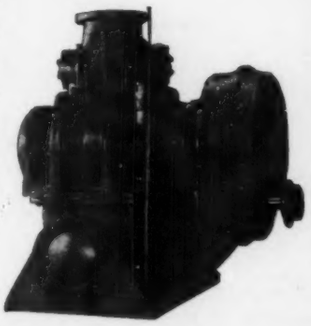

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OFFICES IN ALL PRINCIPAL CITIES

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Air Units

—Care-Free, Oil-Free Air

Freedom from common complaints is the outstanding characteristic of Leader Air Units.

And after all, it's the **complete unit** that counts! The best compressor in the world might be a terrible failure on a poorly assembled unit.

Worthington Compressors (with Laidlaw Feather Valves), Leader Leak-Proof Tanks and careful assembly are the secret of Leader Air Unit satisfaction.

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To be of genuine value to oil men, news of the Petroleum Industry should be presented clearly, thoroughly, and with strict accuracy every week of the year.

The Oil Industry moves with great speed. Conditions change rapidly, old fields apparently settled down to small regular outputs are revived, creating oil-producing sensations; new territories, miles from known producing areas, become prolific oil centers; areas previously condemned as lacking oil-bearing sands develop great pools; new pipe lines make possible sudden expansion of heretofore unknown districts; refinery and natural gasoline manufacturing methods change overnight; prices change quickly.

All important events and changes within the Petroleum Industry are recorded every week in The Oil and Gas Journal so that its readers will be among the very first to benefit.

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Oklahoma-Kansas and Eastern Pipe Line Report

OKLAHOMA-KANSAS
Pipe Line Statement for June.

Runs

	Month	Dly. av.
Prairie P. L. Co.*	4,590,000	153,000
Gulf P. L. Co.	1,928,503	64,283
Texas P. L. Co.	776,754	25,892
Empire P. L. Co.	1,467,410	48,914
Magnolia Petroleum Co..	2,168,966	72,299
Cosden P. L. Co.	825,769	27,525
Sinclair P. L. Co.*	3,090,000	103,000
Oklahoma P. L. Co.	3,076,298	102,543
Other Lines*	6,270,000	209,000
Total June	24,193,700	806,456
Total May	24,994,401	806,271
Difference	801,701	185

Shipments

Prairie P. L. Co.†	6,482,036	216,068
Gulf P. L. Co.	1,861,270	62,042
Texas P. L. Co.	1,140,621	38,021
Empire P. L. Co.	1,307,260	43,575
Magnolia Petroleum Co..	2,259,312	75,310
Cosden P. L. Co.	825,769	27,525
Sinclair P. L. Co.†	3,541,996	118,066
Oklahoma P. L. Co.	3,139,447	104,648
Other Lines*	6,300,000	210,000
Total June	26,857,711	895,250
Total May	26,895,092	867,584
Difference	37,381	27,666

Stocks

Prairie Oil & Gas Co.*	36,972,000
Gulf P. L. & Gypsy Oil Co.	9,805,481
The Texas Company	8,351,672
Empire P. L. Co.	4,067,028
Mid-Continent Petr. Corp.	3,646,027
Sinclair Crude Oil Purch. Co.*	20,400,000
Magnolia Petroleum Co.	9,899,785
Oklahoma P. L. Co.	3,139,985
Carter Oil Co.	10,865,322
Other Companies*	10,675,000
Total June	117,822,300
Total May	118,519,294
Difference	696,994

*Estimated. †Prairie and Sinclair shipments include Texas crude oil.

Note—Stocks do not include approximately 5,600,000 bbls. of crude oil held in storage on private tank farms and leases.

EASTERN PIPE LINE REPORT

Runs From Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for June and July:

	June, '29	July, '29
National Transit	249,968.12	268,968.24
S W Pa. P L	92,002.02	96,958.15
Eureka P L	352,969.84	378,139.18
Buckeye P L (Macksb'g)	319,202.71	352,288.54
Buckeye P L (Cleve.)	11,542.95	12,698.84
Buckeye P L (Lima, etc.)	129,902.81	141,314.51
Indiana P L	6,724.29	5,565.67
Cumberland P L	171,863.19	217,391.68
N Y Transit	30,739.37	32,169.25
Tidewater P L	258,170.41	284,597.46
Pure Oil	55,379.02	164,484.42
Emery P L	65,056.05	72,339.64
Paragon Dev	15,728.09	16,335.33
Stoll Oil Ref	5,767.22	5,453.55
Total	1,765,016.19	2,048,704.46
Daily avg.	58,833.87	66,087.24

Note—Indian Refining Co. also reported other receipts of 353,591.45 bbls. Paragon Refining Co. had other receipts of 259,854.77 bbls. Paragon Development had other receipts of 560.26 bbls.

Petroleum Deliveries

The following tables exhibit the shipments or regular deliveries of various lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky for June and July:

	June, '29	July, '29
National Transit	525,961.70	448,413.13
S W Pa. P L	443,209.38	492,117.59
Eureka P L	249,279.44	268,871.91
Buckeye P L (Macksb'g)	192,141.28	239,542.25
Buckeye P L (Cleve.)	2,429.40	2,190.55
Buckeye P L (Lima, etc.)	1,574,302.18	1,656,505.17
Indiana P L	1,380,019.54	1,426,217.69
Cumberland P L	218,131.40	200,632.22
Southern P L	.....	67,284.36
N Y Transit	250,768.40	308,215.81
Northern P L	160,597.19	173,766.22
Tidewater P L	222,328.15	245,185.79
Pure Oil	58,555.68	163,598.14
Emery P L	67,073.09	67,577.88
Paragon Ref	199,644.69	259,400.21
Paragon Dev	17,693.24	18,142.33
Total	5,562,134.76	6,037,661.25
Daily avg.	185,404.49	194,763.27

Indian Refining Co. reported other deliveries of 440,568.23 bbls.

Gross Stocks

The gross stocks held by various pipe lines in the oil producing sections of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky and Indiana at the close of June and July:

	June, '29	July, '29
National Transit	691,399.07	692,912.76
S W Pa. P L	535,525.28	579,475.28
Eureka P L	1,214,331.14	1,209,058.70
Buckeye P L (Macksb'g)	462,009.23	431,101.70
Buckeye P L (Cleve.)	50,131.07	71,815.42
Buckeye P L (Lima, etc.)	2,088,348.18	2,470,370.27
Indiana P L	542,191.55	638,128.50
Cumberland P L	539,241.87	559,326.34
Southern P L	471,032.50	417,168.75
N Y Transit	256,751.69	235,029.71
Northern P L	332,456.47	416,713.78
Tidewater P L	1,279,682.60	1,109,732.21
Pure Oil	10,619.05	17,189.77
Emery P L	7,937.53	12,197.88
Paragon Ref	23,504.69	22,399.32
Indiana Ref	145,225.30	59,096.91
Paragon Dev	6,051.72	4 897.15
Tuscarora	264,796.11	265,071.90
Total	8,921,275.05	9,211,595.35
Increase	17,715.35	
Increase		290,320.30

Grades of Oil

The following table shows the amount of the different grades of oil held by the Eastern Pipe Lines at the close of June and July showing the gross stocks of the above fields:

	June, '29	July, '29
Penn'a	3,279,171.77	3,230,774.85
Lima	635,542.29	701,522.68
Kentucky	718,933.39	780,445.07
Mid-Continent	3,914,745.95	4,226,436.12
Illinois	372,881.65	272,416.63
Total	8,921,275.05	9,211,595.35

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1926	1927	1928	1929
Jan.	55,630	56,209	52,904	51,749
Feb.	60,394	61,298	57,002	51,833
Mar.	61,644	63,247	57,485	54,252
April	63,019	60,927	56,812	53,444
May	60,580	60,284	62,067	59,902
June	61,121	62,757	58,230	58,833
July	63,206	58,674	57,144	66,087
Aug.	61,815	60,870	57,745	.....
Sept.	64,639	60,285	53,487	.....
Oct.	161,132	147,080	58,100	.....
Nov.	67,774	57,275	53,565	.....
Dec.	58,755	53,089	52,025	.....

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1926	1927	1928	1929
Jan.	156,056	141,227	146,465	165,721
Feb.	159,488	138,534	167,368	159,387
Mar.	150,239	133,777	158,883	161,474
April	152,374	140,227	172,935	169 737
May	160,998	144,594	180,559	184,281
June	160,267	149,772	188,024	185,404
July	160,045	151,850	189,470	194,763
Aug.	151,929	188,653	192,853	.....
Sept.	158,915	144,213	194,138	.....
Oct.	161,132	147,036	176,000	.....
Nov.	172,608	150,975	176,898	.....
Dec.	136,428	144,504	173,572	.....

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1927	1928	1929
Jan.	9,718,008	12,276,710	7,596,564
Feb.	10,119,162	12,180,419	8,738,835
Mar.	10,794,044	12,239,725	9,002,058
April	11,112,295	11,740,125	8,978,172
May	11,359,381	11,602,468	8,903,560
June	11,493,673	11,287,678	8,921,275
July	11,458,128	10,819,331	9,211,595
Aug.	11,989,115	10,236,743	.....
Sept.	12,212,716	9,660,910	.....
Oct.	12,047,661	9,229,709	.....
Nov.	11,939,740	8,366,553	.....
Dec.	12,340,297	7,539,555	.....

Franklin Pipe Co.

The following table exhibits the condition of the Franklin Pipe Line at the close of business for the months named and not counted in the stocks and averages reported above:

1928—	Runs	Shipments	Stocks
June	3,153.08	2,779.02	17,922.58
July	2,902.50	3,628.02	17,197.06
Aug.	2,874.11	2,350.13	17,721.04
Sept.	2,820.31	5,255.42	15,285.93
Oct.	1,289.93	538.89	17,551.93
Nov.	2,663.53	788.47	19,426.99
Dec.	3,053.60	3,167.53	19,426.99
1929—			
Jan.	2,099.90	.....	19,313.06
Feb.	2,469.47	6,873.20	17,009.23
March	3,330.82	3,595.01	16,745.04
April	4,864.07	4,243.59	17,365.52
May	2,688.59	2,455.54	17,598.57

The Illinois Field

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

Gross stocks, August 1	2,215,713.59
Run from wells	583,490.36
Other receipts	310,310.99
Regular deliveries	749,945.27
Other deliveries	484,396.59

The amount of Illinois oil run by the Tidewater Pipe Co. in July was 27,616.43 bbls. Deliveries were 78,214.17 bbls. Adding these figures to those of the Illinois Pipe Line Co. makes the runs and deliveries as follows:

1928—	Runs	Deliveries
Aug.	639,074.85	671,864.02
Sept.	570,307.91	737,293.50
Oct.	626,147.64	626,290.40
Nov.	576,332.88	702,589.93
Dec.	584,633.00	491,517.26
1929—		
Jan.	570,727.38	545,084.66
Feb.	517,330.17	503,387.70
March	728,319.67	586,049.60
April	515,374.27	654,297.96
May	608,981.60	673 812.83
June	568,454.70	818,845.97
July	611,106.79	828,159.44

Tidewater Pipe Co., Ltd., also delivered in July, 232,272.03 bbls. Oklahoma oil.

AVERAGE DAILY RECEIPTS OF CALIFORNIA OIL AT ATLANTIC AND GULF COAST PORTS

Average bbls per day—	ATLANTIC PORTS: Baltimore	Boston	New York	Philadelphia	Others	Total	GULF COAST PORTS: Galveston	New Orleans Baton Rouge	Port Arthur Sabine Pass	Tampa	Total	Total all ports
January	15,838	.....	16,676	11,838	7,938	52,290	.....	.....	.....	.....	5,161	57,451
February	14,214	.....	38,750	17,350	11,607	81,821	.....	.....	.....	.....	3,750	85,571
March	19,903	965	31,258	18,581	7,355	78,065	.....	.....	.....	.....	.....	78,065
April	16,667	.....	32,333	13,233	2,234	64,467	.....	.....	.....	.....	7,333	65,200
May	16,226	2,416	31,326	10,806	2,129	62,903	.....	.....	.....	.....	.....	62,903
June	14,866	3,167	23,100	10,300	6,100	57,533	.....	.....	.....	.....	.....	57,533

AVERAGE DAILY IMPORTS OF PETROLEUM AT PRINCIPAL UNITED STATES PORTS

Average bbls per day—	ATLANTIC PORTS: Baltimore	Boston	New York	Philadelphia	Others	Total	GULF COAST PORTS: Galveston	New Orleans Baton Rouge	Port Arthur Sabine Pass	Tampa	Total	Total all ports
January	11,936	8,903	130,065	34,871	15,709	201,484	.....	34,803	4,093	1,287	40,193	241,677
February	13,750	15,071	135,179	32,750	17,893	214,643	.....	34,357	821	143	35,321	249,964
March	18,548	26,064	145 516	39,162	28,163	257,453	.....	42,581	2,322	.....	44,903	302,356
April	19,733	18,367	137,233	50,267	22,567	248,167	6,867	25,066	10,367	1,500	43,800	291,967
May	29,806	19,258	138,000	49,936	22,322	259,322	6,677	26,323	3,000	1,323	37,323	296,645
June	31,433	8,667	134,600	42,967	18,300	235,967	8,600	22,633	11,800	2,033	45,066	281,033

GROSS PRODUCTION IN THE UNITED STATES FOR 12 MONTHS (REVISED)

(In barrels of 42 gallons)

1928-29		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mts.	Eastern	Total
July:	Month	19,754,458	18,809,188	22,055,737	3,171,548	2,792,139	2,238,090	2,492,586	3,487,000	74,800,746
	Daily average	637,241	606,748	711,475	102,308	90,069	72,131	80,406	112,484	2,412,927
August:	Month	19,444,899	20,840,804	22,339,131	3,147,058	2,711,787	1,989,264	2,561,840	3,556,000	76,590,783
	Daily average	627,255	672,284	720,448	101,518	87,477	64,170	82,640	114,709	2,470,670
September:	Month	18,908,169	22,456,860	21,554,269	3,047,250	2,540,070	1,830,225	2,432,430	3,229,000	75,998,273
	Daily average	630,272	748,562	718,207	101,575	84,669	61,007	81,047	104,300	2,533,279
October:	Month	19,430,993	23,431,071	22,176,853	3,058,460	2,652,484	1,836,321	2,571,822	3,612,000	78,769,903
	Daily average	626,806	755,841	715,376	98,660	85,564	59,233	82,962	116,516	2,540,964
November:	Month	19,907,526	22,078,680	20,791,798	2,977,800	2,476,080	1,801,914	2,388,870	3,348,000	75,770,668
	Daily average	663,584	735,956	693,059	99,260	82,536	60,064	79,629	111,600	2,505,689
December:	Month	21,574,703	22,425,722	22,180,102	2,988,400	2,521,671	1,846,841	2,289,040	3,581,000	79,407,379
	Daily average	695,958	723,410	715,487	96,400	81,341	59,576	73,840	115,516	2,561,528
January:	Month	23,385,939	22,575,874	23,412,228	2,861,641	2,463,526	1,807,887	2,076,070	3,439,000	82,012,163
	Daily average	754,385	728,254	755,233	92,311	79,146	58,318	66,970	110,936	2,645,554
February:	Month	22,300,707	20,464,164	20,816,209	2,557,968	2,154,194	1,569,930	1,965,656	3,113,000	74,941,228
	Daily average	796,454	730,863	743,484	91,356	76,936	56,068	70,202	111,184	2,676,472
March:	Month	24,324,729	20,838,262	24,358,592	2,951,076	2,303,734	1,756,153	2,195,823	3,586,000	82,314,359
	Daily average	784,669	672,202	784,669	95,196	74,314	56,650	70,838	115,677	2,655,302
April:	Month	23,295,060	20,235,290	23,493,097	3,112,740	2,188,680	1,702,479	2,085,030	3,624,000	79,636,376
	Daily average	776,502	674,513	783,103	103,758	72,956	56,750	69,501	117,467	2,654,546
May:	Month	24,053,351	21,345,453	24,489,101	3,665,099	2,220,158	1,713,261	2,262,522	3,679,000	83,617,945
	Daily average	775,915	688,563	789,965	118,229	71,618	55,267	72,662	125,129	2,697,353
June:	Month	24,624,627	20,561,113	24,696,029	3,636,150	2,112,270	1,699,581	2,180,752	3,887,000	83,399,521
	Daily average	820,821	685,371	823,267	121,205	70,337	56,653	72,692	129,567	2,779,984
	Total 12 Months	261,005,160	256,062,480	272,365,144	37,175,190	29,126,623	21,791,846	27,492,441	42,241,000	947,259,844
	Daily average	715,083	701,541	746,207	101,850	79,799	59,704	75,322	115,729	2,595,231

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